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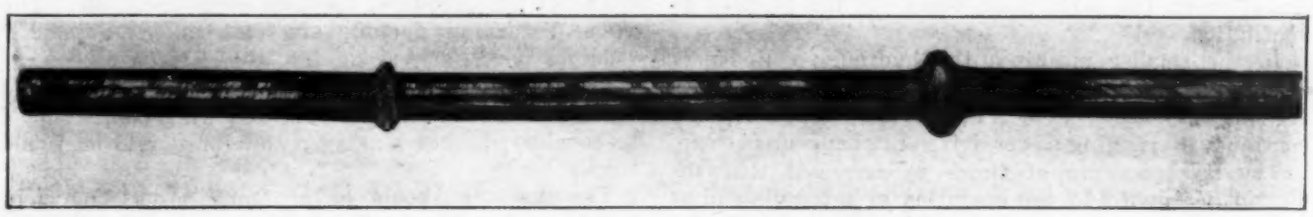


FIG. 1—ROD WITH FLASH AND SLOW BUTT WELDS

Butt Welding

By A. L. De LEEUW
Consulting Editor, *American Machinist*

The process of upset welding—Hand and automatic machines — Welding pieces of different sizes — Tie welding and other applications

BUTT WELDING is the joining of two pieces of metal, end to end, by means of the welding process. There are two systems in use which, though depending on the same general principles, are quite different in practice and will therefore be treated separately.

In the process known as slow butt welding or upset welding the two pieces to be welded are pressed together with considerable force while the current is applied. When the pieces have reached the proper degree of plasticity, the pressure is increased. As a result the softer metal, that is the metal at the joint, is squeezed out and forms a flash or enlargement around the juncture.

There is shown in Fig. 1 a rod which has two welded joints, one made by the slow butt welding process (the one to the right), the other by the flash welding method.

The type of machine used for the purpose is shown in Fig. 2, where the smallest size made by the Thompson Electric Welding Company is placed on top of a large machine, which is their largest size but one.

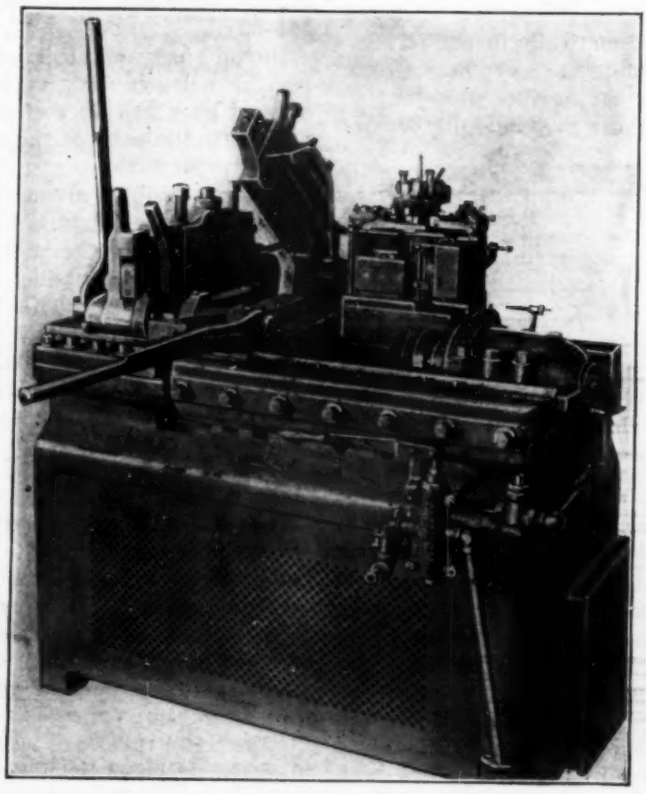


FIG. 2—THOMPSON SLOW BUTT WELDING MACHINE

The large machine shows plainly the two clamping devices for holding the work. It also shows the hydraulic cylinder that moves the right hand clamp which, as plainly visible, is built on a slide bearing on the main frame of the machine. The left hand clamp is stationary. This machine, being of the heavier type, uses very heavy clamps. As will be seen the upper part of the clamp can be brought down, after which a clasp can be brought around a projecting part of it to prevent it from going back. The long lever operates an eccentric and brings the clasp down hard on the upper clamp thus securing the work under considerable pressure. The dies are attached to upper and lower clamps.

On the right side of the main frame, one sees the pump which is operated by hand and furnishes the pressure in the hydraulic cylinder. Sometimes the machines are arranged so as to take the pressure from

an accumulator but quite often they are arranged as shown in the illustration. The turning of a valve handle causes the slide to move either toward the left for welding or toward the right for opening up. The perforated plate in front of the machine is merely a cover for the transformer, the perforation being for the purpose of ventilation.

In the smaller machines the hydraulic cylinder is replaced by a hand lever whereas in automatic machines the slide may be moved back and forth by means of some continuously running power driven mechanism.

The machines are at times so arranged that the current is applied by the operation of a treadle and at other times by the operation of a hand switch. On the smaller machines the switch is often controlled by the hand lever, that is, the same lever by which the pressure is applied. Where this is the case the switch can be set in such a way that the circuit is closed when the operator grasps a spoon handle attached to the pressure lever whereas the circuit is opened as soon as the lever is moved beyond a certain point. Means are provided to set this mechanism so that the current is turned off the moment the lever has made a sufficient amount of movement for the purpose of welding or, in other words, immediately after the heavy pressure has been applied.

Where such a device is furnished we find the following cycle of operations:

1—The operator puts the two pieces in the dies with the proper amount of projection.

2—He closes the dies.

3—He grasps the operating lever but without taking hold of the spoon handle and by means of the lever brings the two pieces to be joined against each other.

4—He takes hold of the spoon handle which closes the circuit.

5—When, in his estimation, the pieces have been brought to the proper degree of heat he applies additional pressure to the lever, the pieces are squeezed together and the current is automatically turned off.

6—He opens the clamps, brings the lever back to the starting position and removes the finished piece.

As the pressure brought to bear may be quite consid-

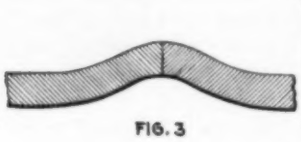


FIG. 3

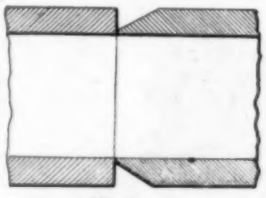


FIG. 4

FIG. 3—DIAGRAM OF FLASH FORMED IN WELDED TUBING.
FIG. 4—METHOD OF CHAMFERING TO REDUCE FLASH

erable there would be danger of the pieces slipping through the dies unless some positive means were provided to hold them in position. This is accomplished by providing adjustable stop screws against which the ends of the pieces may butt. The stop screws may have to be adjusted for every piece because it is important that the projection of the piece beyond the die shall always be the same provided, of course, that we are handling work of the same material and diameter.

Such butt welding machines lend themselves very well to automatic operation. If once the proper amount of pressure and the correct amount of voltage has been determined for a certain job and the length of time during which the current should be applied, then these data can be embodied into an automatic machine with almost absolute assurance that every weld will come out perfect.

There are, however, various disturbing factors against which we must guard; such factors for instance as the stock not being square, the dies being dirty, etc. The same disturbing factors are met in non-automatic welding.

We will first take the matter of butt welding of solid stock of ferrous material. The following points should be considered when making a slow butt weld on round stock:

The machine should be of ample size. The stock should project beyond the dies not more than is abso-

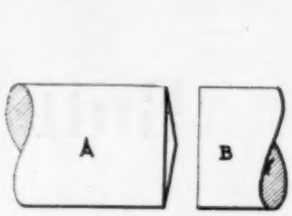


FIG. 5

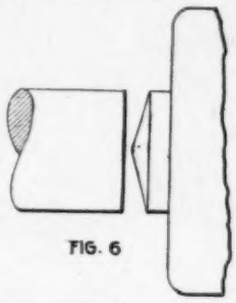


FIG. 6

FIG. 5—DEVICE TO INSURE CENTRAL HEATING FIRST.
FIG. 6—SAME DEVICE ON PIECE OF LARGE DIAMETER

lutely necessary. This amount may vary between 1 and 1½ diameters of stock. The amount to be squeezed out when making the weld should be equal to about ¼ of the diameter. Taking as an example the welding of two pieces of ¾-in. round stock, we would let each end project beyond the die an amount between ¾ and 1⅛ in. and we would figure on losing $\frac{1}{16}$ in. from each of the 2 pieces so that if each of the two pieces were 6 in. long originally, we would get a welded piece of 12 in. — ⅛ in = 11⅞ in.

Round stock and stock of which the cross section is a regular polygon such as a square or hexagon, should have at least two lines of contact with each die so as to distribute the path of the current through the stock as evenly as possible.

Notwithstanding all one can do the path of the current through a piece of stock must vary somewhat in length. In addition the center of the stock does not lose its heat as rapidly as the outside so that as a rule the centers will be heated first. This is as it should be. However, it frequently happens that the stock is not cut off square or, if it is, that the dies are not equally square or in line. As a rule the two pieces might bear against each other at one point only and it is at that point that they would heat very rapidly. When this is the case a bad weld might be made. To avoid it one should break the current as soon as the point of contact has heated somewhat and then pull the two pieces apart to give the heat a chance to distribute over the entire cross section, after which a new contact is made. If the heating is still eccentric the pieces are pulled apart once more and this is repeated as often as may be necessary to cause the two pieces to heat all around evenly. The action of shutting of the current and pulling the pieces apart is called "nursing."

When two tubes are welded the projection beyond the dies should be somewhat more than it would have been if the same amount of metal, but in the form of a solid rod, had been welded. To illustrate this, suppose we

have a tube 1½ in. in diameter and with a thickness of wall of ⅞ in. Then the amount of metal is equivalent to the amount of metal of a 1-in. bar. If we actually had to weld a 1-in. bar we would make the projection from 1 to 1½ in. beyond the die, but with the tubes we would make this projection somewhat more.

The peculiarity of tube welding by the slow butt process is that no flash or burr is formed on the inside of the tube, it all appears on the outside. Where tubes are welded in large quantities it is customary to arrange the machine so that a mandrel can be inserted while the work is still hot and a roll pressed against the burr so as to straighten out the welded portion and remove the flash entirely or practically so.

The nature of the flash or projection formed on the tube is indicated by Fig. 3. To be doubly sure that no inside flash shall be formed it is advisable to chamfer one of the two pieces as indicated in Fig. 4.

The voltage used in this process of welding varies with the size of stock to be welded. It is sometimes as low as 1½ volts and very seldom goes above 3, although there are cases when voltage as high as 3½ is used. It is very important that the cross section of the copper connection and the dies should be ample so as to have as little resistance as possible outside of the resistance at the joint or weld. It is further important that the dies should be free from oxides or other impurities. Copper is used almost exclusively for the dies, though where non-ferrous metals are welded, steel dies are sometimes used. In that case the dies should have much larger cross section and larger contact area, and the work and the pieces should be clamped under heavier pressure.

The amount of current required with this system of welding is from 20 to 25 kw. per sq.in. cross section. This amount may be somewhat reduced if a longer time is allowed for the making of the weld. It may be said as a rule that the heating should progress as rapidly as possible provided that it can be done evenly and properly. It might seem at a glance that there would be some ad-

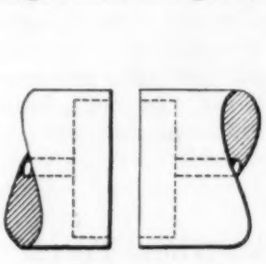


FIG. 7

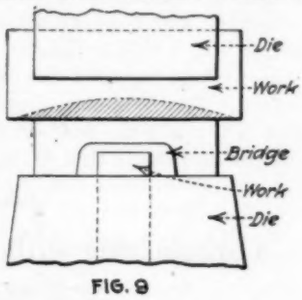


FIG. 9

FIG. 7—COUNTERBORING PIECES TOO LARGE FOR THE MACHINE. FIG. 9—SET UP FOR TEE WELDING

vantage in the slower welding because less current is used. However, though it is true that less amperes are used up in any one moment, the total amount of current used, that is the total amount of kilowatt hours, is more when heating slowly.

One of the things to be considered is that the amount of resistance on both sides of the joint should be practically the same. As long as the two pieces to be welded are of the same material and cross section all that is necessary to meet this requirement is to have the same length of stock project beyond the dies. However, as soon as the pieces of material are of different composition or of different cross section or both, this rule no longer holds good.

If, for example, we should have to weld a piece of mild steel to a piece of tungsten steel we would have different resistances on the two sides of the joint notwithstanding that the cross section of both pieces may be the same. In this case we would let the piece of mild steel project from 2 to 2½ times as far beyond the die as the high speed steel.

It should be remarked here that the ratio of the projections beyond the die is not necessarily the same as the ratio of the resistances per unit of length. In the first place the resistance of the projecting part does not stand alone. There is also resistance in the dies, in the wiring, etc. In the second place the fact that a piece

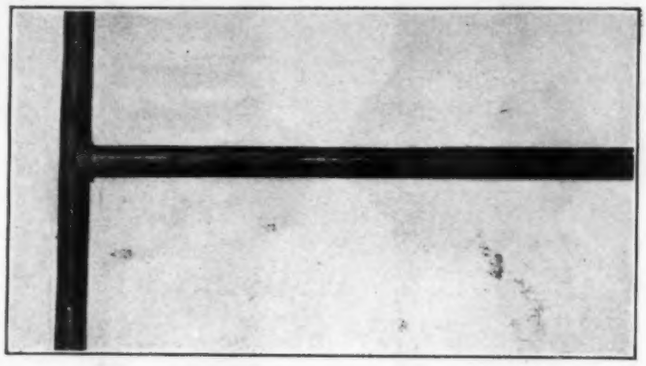


FIG. 8—A TEE WELD

projects farther makes it retain the heat much better, for it should be remembered that most of the heat is carried off by the dies though, of course, a small part is also carried off by radiation. We will notice when two pieces are welded together, one with a large and the other with a small projection beyond the die, that the heated portion of the long piece is longer than that of the short one. Any method by which we can vary the amount of resistance or rapidity with which the heat is carried off will have this effect on the amount of projection which we should allow beyond the die.

When two pieces of unequal cross sections must be welded various methods can be employed. In the first place we may reduce the end of the larger piece until it corresponds to the smaller. The length of the reduced section should not be less than 1½ times the diameter of the smaller piece. This is not always possible and even where it is possible it may not be desirable. If, for instance, we should have to weld a shank of relatively small diameter to a piece of high speed steel of relatively large diameter, we would, for the sake of economy, want the piece of high speed steel as short as it is possible to make it, and consequently would not want the long reduced section.

Referring to Fig. 5 we call attention to a little artifice often used to prevent trouble on account of the two pieces not being perfectly square. The two pieces *A* and *B* shown in the illustration are of the same diameter. In order to be sure that a slight deviation from perfect squareness shall not cause any trouble the piece *A* is cut off in the lathe so that the end is a flat cone. This insures that the heating begins in the center regardless of whether the piece *B* is perfectly square or not. The same artifice is used when it is not possible to make the projecting part of large diameter pieces as long as it should be made. Fig. 6 shows how this is accomplished. A very short projection is left on the large piece but this projection is pointed. The double length of projection in such a case does not need to be longer than that required for the proper amount of flash.

It happens quite often that a job of welding must be done requiring a larger machine than the one on hand. This would be a simple matter if it were permissible to cut the two pieces down to a diameter corresponding to the capacity of the machines but as a rule this is not the case. In such cases one should counter bore the two pieces as shown in Fig. 7 so that the

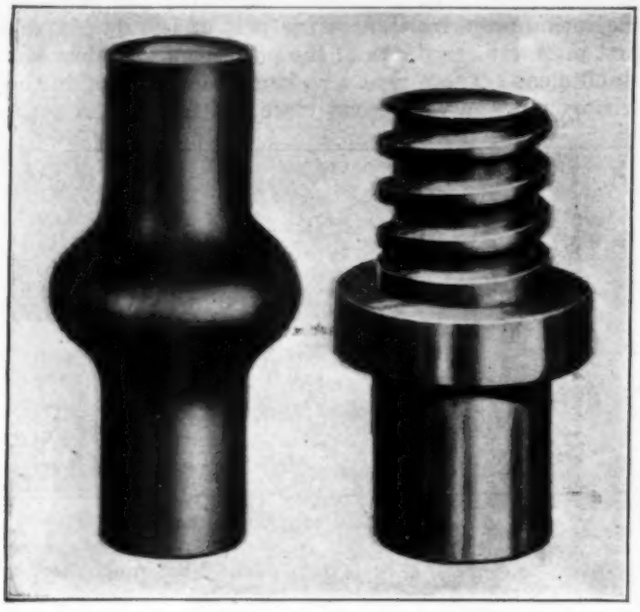


FIG. 10—FORMING A BULB TO GET STOCK FOR SUBSEQUENT MACHINING

amount of metal left on the rim is less in area than the capacity of the machine permits. When this trick is resorted to one should be careful to make provision for the escape of gases formed in the hole between two pieces. The best way to accomplish this is to drill holes through the centers of the two pieces and if this is not possible a hole may be drilled leading out to the side of one piece or again if this should not be permissible one or two notches can be cut in the rim of one of the pieces. Even this last method is not absolutely sure because the notches may be filled with metal before all gases may have escaped and this may cause a blow-out when the final pressure is applied.

A modification of slow butt welding is tee welding. Such a weld is shown in Fig. 8 and the method for accomplishing it in diagramatic form in Fig. 9. The two pieces of work are held in their own set of dies but are not brought in direct contact with each other, at least not at the beginning. The piece marked "bridge" is placed between the die holding the small piece and the large piece. As a result the shaded area is first heated. When this area has been brought to the proper heat the bridge is removed and the small piece is pressed directly against the large one. Of course, it requires a certain amount of experimenting to determine the length of time required to obtain the proper pre-heating of the large piece. It should be remembered, however, that butt welding allows a large amount of lee-way in almost every requirement so that absolute time or distance or section is never essential.

The various points mentioned here have been brought up to indicate the importance of certain elements but were not intended to mean that no variations from the ideal are permitted. If for instance, the large piece of work in this case were not sufficiently pre-heated the only result would be that the smaller piece of work would heat up too rapidly. This condition becomes easily visible so that it is not difficult to correct any error which may have crept in. In the case mentioned we would simply pull back the die which holds the small piece of work, replace the bridge, heat the large piece of work a little more and try again. If a large amount of work of this kind has to be welded it would pay to make some careful experiments in order to determine the best amount of projection, voltage, time for pre-heating, etc. In fact, in all cases where quantity work is done such experimentation should take place, and the time spent for it will be saved many times over. To express this in a few words, we would say that the same care should be exercised in the collection of data for each job as if these data were to be used later on for the design of an automatic machine.

A peculiar application of the principle of heating by electricity and a very valuable one is shown in Fig. 10. The finished piece to be made is shown at the right side. In this case the piece is brass, though what follows would apply equally well if not better to other materials.

The figure on the left side shows the piece before machining. The bulbous enlargement in the center is obtained by holding the two ends in the dies of a butt welding machine, heating the center and compressing the piece when sufficiently heated. In this manner we can do up-setting for various kinds of work such as collars or eccentrics for small cranks, or cams which must be made integral with a shaft. It is often possible to make a shaft with a number of these projections and one may go a step further and combine such a butt welding machine with a press and forge the shape required from the bulb generated in the welding machine. Such a double-purpose machine might be made either automatic or hand operated.

Correction

Attention is called to an error in the first article in this series which appeared under the title "Resistance Welding" in Vol. 17, No. 19. On page 721 near the end of the first paragraph the word "not" was erroneously inserted. The sentence should read, "In books, 30 to 40 years old, one may find the statement that one of the qualities of iron is that it is weldable."

Carbonizing with Acetylene Torch —Discussion

BY R. E. MARKS

The article on page 930, Vol. 57 of *American Machinist* on carbonizing by means of an acetylene torch is of interest, especially the utilization of the fan motor to turn the wheel automatically by means of the long pawl shown.

It shows, however, that really new things are hard to find as this same method has been used by the Pierce-Arrow Co. for several years. This was designed by Hans Buerk and put into operation in March, 1916. It was, in fact, illustrated on page 116, Vol. 53 of *American Machinist*. This seems to indicate that in spite of splendid journals like the *American Machinist*, new shop ideas travel more slowly than we think and are sometimes inadvertently and unfortunately credited to the wrong man.

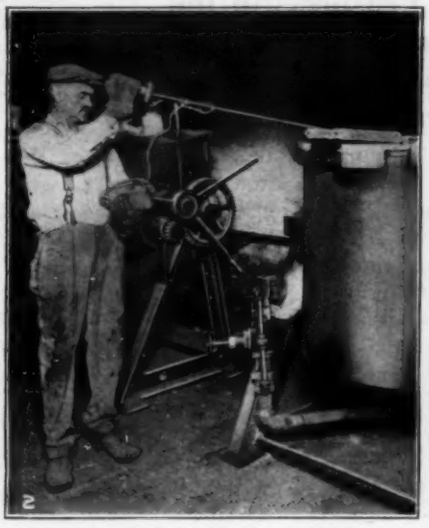


FIG. 1—MOLDING SWEEPER BODIES. FIG. 2—TESTING METAL TEMPERATURE. FIG. 3—PREHEATING POURING LADLE

Glimpses of a Modern Aluminum Foundry

By FRED H. COLVIN
Editor, *American Machinist*

Methods of molding—Controlling temperature of metal by pyrometer and by pre-heating ladles—Mechanical sand separation and reconditioning—Band sawing gates

FIVE VIEWS in the foundry of the Hoover Suction Sweeper Company, North Canton, Ohio, give a good idea of the completeness of its equipment and the way in which the work is handled. In Fig. 1 the patterns have just been withdrawn from the molds and rolled up out of the way. A molder and helper turn out 17 molds per hour with this machine.

The quality of aluminum castings depends largely upon the temperature at which the metal is poured. To keep tabs on this the men check every furnace before the metal is poured out into the ladles. In Fig. 2 the temperature is checked by pyrometer with the thermo-couple at the end of the long rod. Before running the aluminum into the pouring ladle the temperature of the ladle is brought up to the proper point by means of a gas heater inserted in the ladle before using, as shown in Fig. 3.

Hand work is eliminated as far as possible in this foundry. The molds are dumped into a tilting truck which is then picked up by motor carrier and taken to the intake hopper of the sand reclaiming machine as shown in Fig. 4. Here the load is dumped on the grating, the sand going through and the castings being placed in the truck shown. About 300 truck loads (45 tons) of castings are handled per day at this point. The sand is then mixed with a proper proportion of new sand and reworked and is then ready for use again. Band saws are used for cutting off the gates as shown in Fig. 5, this method leaving a clean surface without stressing or deforming the castings in any way.

FIG. 4—DUMPING MOLDS OVER SAND GRATE. FIG. 5—SAWING OFF GATES

What Are the Worker's Prospects in the Machinery Building Industry? —Discussion

By Gaylord G. Thompson

The article under the above title by myself appearing in the *American Machinist*, page 537, Vol. 57, in answer to A. W. Forbes' article of same title, apparently does not harmonize with the opinion of Mr. Forbes insofar as it concerns the starting wage of the 14 year old boy, the earning abilities of the exceptionally bright boy and the exceptionally bright college graduate.

Before entering further into this discussion let us consider this question: To what generation of workers are these curves applicable? If we start these curves on the present-day earnings of a 14 year old boy or other worker entering into manufacturing activities for the first time, the resultant calculations would be merely an expression of future possibilities based on the present-day economic conditions. We have no assurance that the monetary valuation for labor will be the same twenty years from now as it is today.

Now that we cannot manipulate these curves to give absolutely reliable calculations of future labor value, is it possible then to base the curves on available statistics gleaned from the past earnings of the workers who today are 55 years of age or more? The answer is yes, but, we would again be confronted with the fact that the worker's earnings were considerably smaller 40 years ago when a skilled worker in a shop at that time was earning considerable less than Mr. Forbes pays a 14 year old boy today, namely 25 cents per hour.

Considering that we cannot therefore use the earning ability of the past generation or the earning probabilities of the coming generation of workers we must reconcile ourselves to a happy medium between these two extremes to develop a set of curves to harmonize with the present generation, whose ages would average approximately 35 years.

A Hypothetical Case

Assuming that we have before us a young man 35 years of age who is considered an "exceptionally bright boy" and regarded as the average representative of his class. Twenty-one years ago, when this young man was 14 years of age, were there any manufacturers paying 25 cents per hour to boys of that age as Mr. Forbes is doing today? Undoubtedly not. Those were the times when a 14 year old boy would receive from five cents to ten cents per hour. This young man I have represented in my curve as averaging $45 per week at the present time and climbing rapidly as he develops the matured judgment and respect consistent with age.

The curve *A*, which Mr. Forbes compares to my curve *A*, shows the "exceptionally bright boy" earning approximately $75 per week at 28 years of age. Is Mr. Forbes very sure that he was paying this young man 25 cents per hour when he was 14 years old fourteen years ago? If so, the curve as it stands is perhaps correct as to his standard of wage payments. If not, then a false impression is conveyed because of using the present-day hourly rate of a 14 year old boy as the hourly rate of a 14 year old boy 14 years ago.

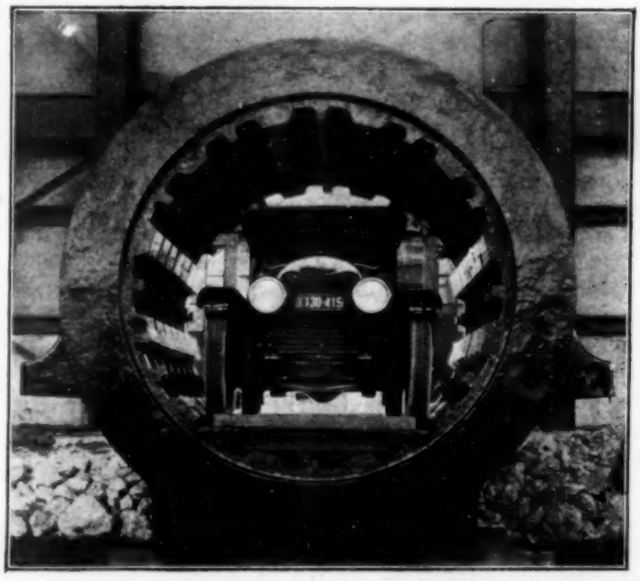
The principle underlying my arguments affecting the "exceptionally bright boy" also holds true with the "exceptionally bright college graduate." I cannot agree however with Mr. Forbes that the "exceptionally bright boy" without college training will always maintain a lead over an equally capable boy with a college training. I give the former an advantage over the latter only insofar as it concerns practical experience. The latter, once having attained practical experience is better fitted by mental training to make more rapid strides toward the goal of their respective achievements.

The wide difference between Mr. Forbes' and my own opinion concerning the earning abilities of these individuals is due perhaps to the higher standard which Mr. Forbes has set. Although there are many workers who undoubtedly measure up to the qualifications and earning abilities as exemplified by Mr. Forbes' article, I have been conservative and very careful not to include such workers who by their unusual environments or inheritance are bound to succeed almost in spite of themselves.

The compilation of my set of curves was based on data which I have accumulated during my experiences as a factory worker, teacher, manufacturing executive, and employer.

A 75-Ton Casting from the Ford Foundry

Just to show the capacity of the new Ford steel foundry and its electric furnaces we illustrate a casting recently turned out. This casting is for the field of a huge turbo-generator set being built for the new power house. The height of this casting is 12 ft. 3 in.; the extreme width 14 ft.; the outside diameter 12 ft. and the inside diameter 100 in. The heaviest section of the metal is



A 75-TON GENERATOR CASTING

7 in. and the lightest, in the outside wall, 2 in. The size can be better appreciated by comparing with the Lincoln touring car in the inside. The casting is of semi-steel and weighs 75 tons.

An interesting feature is that a casting of such size could be successfully made in a plant where the average work is so very much smaller. The answer is that in a plant of this size, employing thousands of men, it is comparatively easy to find enough skilled men for any special job, from making a 75-ton casting to doing watch work. The resources of such an industrial army are almost unlimited.

Oscillations and Fatigue of Springs

By JOSEPH KAYE WOOD
Engineer, Western Electric Co., Inc. and A. T. & T. Co.

The first article—General cases of vibration—Period equation derived with assumed constant load attached to spring—Damped vibrations

IN THE AUTHOR'S previous articles on the design of springs, published in Vol. 55 of *American Machinist*, the important matter of the oscillations of springs was not covered. This subject, which brings in the additional factor of time or period of oscillation can be advantageously considered from a general point of view as the subjects in the articles previously mentioned were treated.

This general method of treating the subject of spring design is felt by the writer to be an efficient one. It is certainly better economy to have a common starting point with two or three highways, each with a minimum number of branch roadways, which insure maximum convenience, than to have a complex system of roadways, each emanating from the same starting point.

Hence, in this analogy, the common highways are the general formulas given in the article "Spring Design in General" on page 757, Vol. 55 of *American Machinist*, for the load deflection rate (l.d.r.) and for the spring criterion (s.c.) of safe stressing. The branch roadways are the constants ψ and θ contained in these formulas, the values of which depend upon three things, namely, the spring form, (helical, spiral or flat,) the cross sectional form of material, (round, square, elliptical or rectangular,) and the kind of elasticity involved, (twisting, bending or a combination of both). Fig. 1 shows, diagrammatically, the scope of this general policy.

A body is said to oscillate or vibrate when it moves forward and backward, on either side of a stationary point of reference, alternately. There are many cases of oscillating bodies which cannot possibly escape the attention of even the most casual observer. Our very lives depend upon the accurate oscillations of our hearts. We exchange thoughts through the agencies of a tympanic membrane or ear drum and of a pair of vocal chords in which the ear drum is set in vibration by the sound waves (air disturbances) generated by the vibrating vocal chords of the person transmitting the thought.

The distance through which thoughts can be exchanged by the vibrating organs of the body, is limited

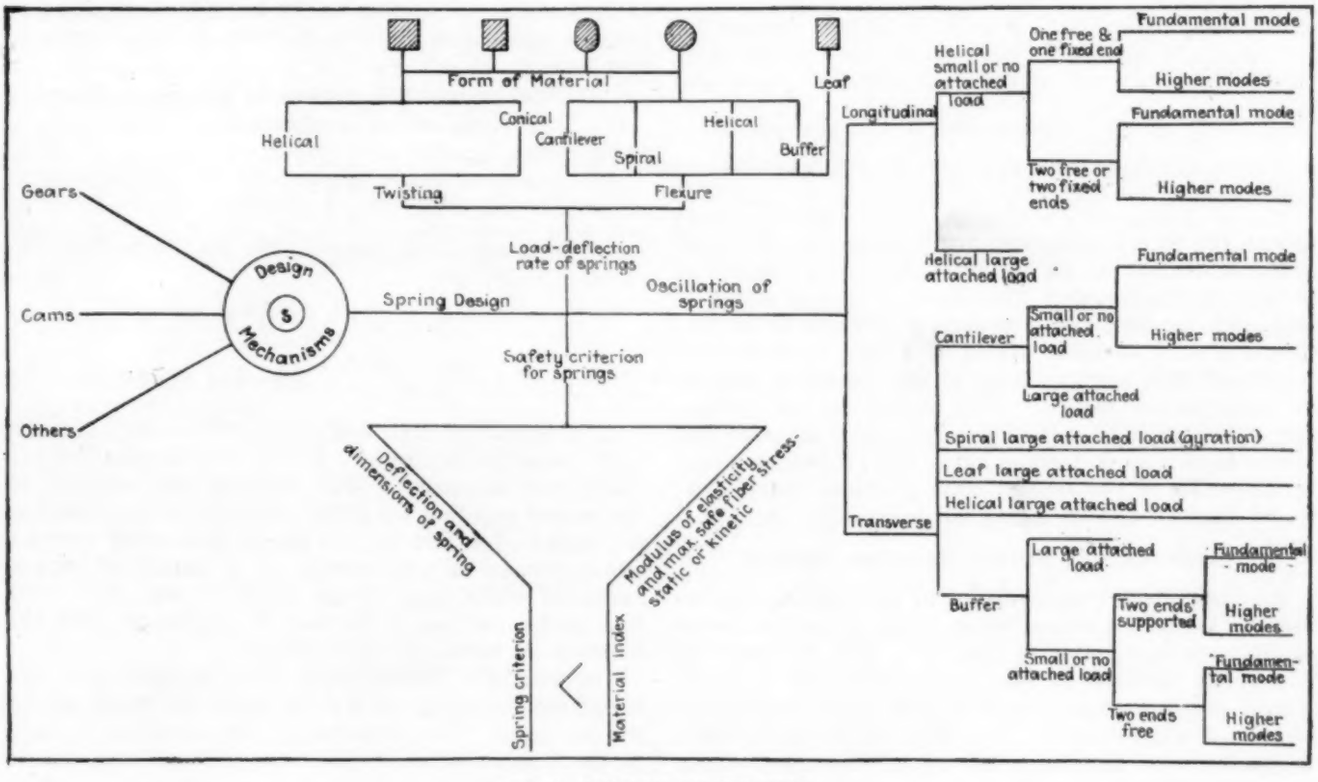


FIG. 1—DESIGN OF SPRINGS

at most, to only a few hundred feet. However, by the additional use of two vibrating metallic disks and a certain amount of electrical energy transmitted in the form of telephone currents or radio waves, thoughts can be exchanged through thousands of miles.

Cases of oscillations which are visible to the human eye, are: The constant swinging of a clock pendulum, the vibrating hair spring of a watch, and those that are of interest to the vacationist, the pleasant oscillations of a good set of automobile springs or the diving board at the beach.

In a great many cases, as for example, in the pendulum, the forces producing displacements of the mass are proportional to (or nearly so), and in opposition to these displacements. The result of this condition is that each forward and backward movement, or oscillation occurs in an equal period of time. Various textbooks call this motion either simple harmonic motion or isochroneous motion. The oscillations of springs are of this type of motion, because the displacements, better known as deflections, also are proportional and in opposition to the applied loads, provided the proportional limit of the spring is not exceeded.

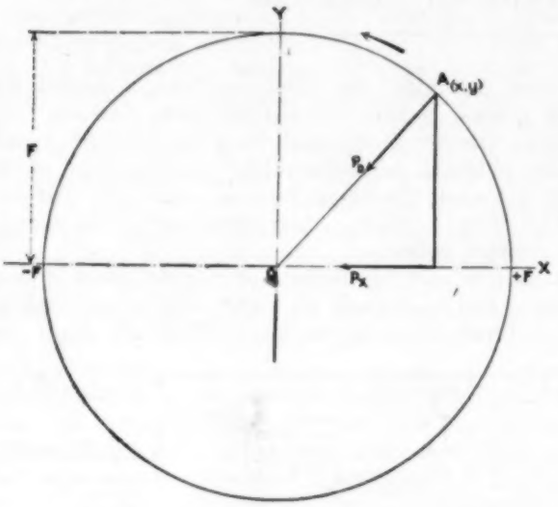


FIG. 2—CIRCLE OF REFERENCE FOR SIMPLE HARMONIC MOTION

Period for Any Simple Harmonic Motion

An instrument that is useful in deriving an expression for the period of oscillation of any simple harmonic or isochroneous motion is that of a body moving with a uniform velocity in the circumference of a circle. Fig. 2 shows such a body A of which the rectangular co-ordinates are x and y. The deviating force P_D which keeps the body moving in a circumference acts along the radius F. P_x and P_y are the rectangular components of this force. We are interested principally in these components, because they produce motions of translation, similar to those produced by spring loads. In other words, they are the equivalent forces which would move the body according to its projected positions on the corresponding x or y axis. As the motions on these axes are similar, it will not be necessary to analyze both of them. We therefore will choose the motion on the x axis and determine the time T it takes for the projected body to travel from O to $+F$ back to O, to $-F$ and back to O again. This time interval is called the period of oscillation.

By geometry $X = F \sin \alpha$.

By mechanics $\alpha = \omega t$ where ω is the angular velocity which substituted in the preceding equation gives

$$X = F \sin \omega t. \quad (1)$$

Differentiating (1), $\frac{dx}{dt} = -\omega F \cos \omega t$, which is equal to the velocity of the projected body at the end of t seconds. By differentiating this expression again, the linear acceleration is obtained:

$$\frac{d^2x}{dt^2} = -\omega^2 F \sin \omega t = -\omega^2 X \text{ [from (1)]}. \quad (2)$$

Now the component force P_x is equal to the mass M of the projected body multiplied by the acceleration,

$$P_x = M\omega^2 X = \frac{\text{Weight}}{g} \times \omega^2 X = \frac{W\omega^2 X}{g}. \quad (3)$$

Hence this equation shows that we have the condition in which the displacements are proportional and are in opposition to the forces producing them. This is a condition which is identical with the isochroneous oscillations of a spring whose effective mass has the acceleration $\omega^2 X$. Thus the geometric constants of a circle involved in the angular velocity ω should appear in the expression for the period of oscillation T. To show this, the angular velocity ω will be substituted in equation (3) in terms of the time T of one revolution of the body A. In mechanics, we know that the angular velocity is equal to the rate of increase of the angle α, that is,

$$\omega = \frac{2\pi \text{ (number of radians in one revolution)}}{T \text{ (time of one revolution)}}.$$

Substituting in (3),

$$P_x = \frac{W}{g}\left(\frac{2\pi}{T}\right)^2 X,$$

where X is any displacement. For maximum displacement, $X = F$, and

$$P_{max.} = \frac{W}{g}\left(\frac{2\pi}{T}\right)^2 F,$$

$$T = \frac{2\pi}{\sqrt{g}}\sqrt{\frac{WF}{P}} = \text{period of oscillation}. \quad (4)$$

As a matter of fact, and as will be shown later, the circle constant 2π appears in the period equation for every type of spring. This constant also appears in the period equation for every vibration even though it is complex; for Fourier has shown that every complex vibration can be represented by a group of simple harmonic vibrations. Thus in this case, the circle is a useful instrument in that it supplies us with the constant 2π in the period equation.

The maximum displacement F corresponding to the maximum restoring force P is called the amplitude of the oscillation. The frequency of the oscillation is equal to the number of oscillations per unit of time and is numerically equal to the reciprocal of the period of oscillation.

So far all parts of the oscillating mass have been considered as moving together with an equal velocity, that is, as having equal displacements at any instantaneous moment. This assumption is not true for oscillating springs, because they have fixed or clamped parts, and at any instantaneous moment, the deflections or displacements increase from zero at the fixed part to a maximum at the free end. Thus an elastic wave motion is set up in the spring, which is then said to vibrate in a wave of the gravest or fundamental mode. When a spring oscillates in such a way that the nodes, that is,

additional parts which do not suffer displacements, exist, then it is said to vibrate in its second, third or fourth mode according to the number of nodes.

Springs are rated statically by the deflection per given load at the free end where it is a maximum, that is by the load-deflection rate (l.d.r.). Therefore, in order to maintain the terms representing the l.d.r. in the period equation for springs, some factor less than unity must be introduced into the numerator of formula (4) which will depend upon either an equivalent velocity for the mass of the spring or an equivalent mass for the velocities which occur at the end of the spring. In other words, the true kinetic energy transformed from, and equal to the potential energy stored in the spring each time deflected will be something less than $\frac{W V^2}{2-g}$ where $\frac{W}{g}$ is the mass and V is the velocity at the free end of the spring. Another factor, less than unity must also be introduced into formula (4) for the case in which a spring vibrates in a mode other than its gravest or fundamental. Both of these factors will tend to decrease the period of oscillation.

However, to simplify the treatment of the subject in hand, the assumption will be made, tentatively, that a vibrating spring has a rigid mass, large in comparison with the mass of the spring, secured to the free end. Thus the mass of the spring can be neglected without causing appreciable error, and only the deviating force will be considered as being derived from the latter mass, in other words, from the elasticity of the material. All parts of the rigid mass will then move together with equal velocities, and it is known that a spring loaded in the above manner will vibrate in its gravest mode. Hence, the two factors previously referred to need not be included in the period equation which now will be derived for all types of springs. In the next article the mass of the spring will be taken into account, and the two factors determined for each type of spring.

In Fig. 3 are shown a flat spring as it would vibrate under a large load and its relation to the load-deflection curve. Position OA_E shows the spring when it is in static equilibrium, though under stress due to the constant or rigid load W, while OA_1 and OA_2 show the extreme positions to which it makes its first oscillation. The corresponding loads are shown on the curve. The shaded triangles represent the potential stress energy which is available for transformation into the necessary kinetic energy to keep the spring oscillating.

The dotted circle is drawn merely to show that this motion is isochroneous as illustrated in Fig. 2. The symbols $+F$ and $-F$ each represent the amplitude of oscillation while $+P$ and $-P$ represent the corresponding restoring forces. When the constant load W is removed, the datum plane of equilibrium $A_E - A_E$ is simply moved to $A - A$ and the corresponding load-amplitude triangles remain the same. Of course in the case which we are considering now, the period of oscillation will be found to be very much greater, because of the larger mass involved.

Suppose while the spring is vibrating, it is drawn along the plane $A - A$. The sine curve shown in dotted lines would be traced by the point A, provided no other forces resisted the motion; that is, the spring would keep on oscillating forever. But as in all cases of motion, frictional forces under the general name of "damping" forces oppose the motion as soon as it is started, and the actual sine curve traced would be the one drawn in a solid line in Fig. 3. This curve is called a "damped sine wave." The action in detail is as follows:

The potential stress energy equal to $\frac{PF}{2}$, shown by the shaded triangle in Fig. 3, is stored in the spring by a load $+P$ acting at the amplitude $+F$. Upon the load being removed immediately, the potential energy is transformed into kinetic energy equal to $\frac{WV^2}{2g}$ where V is the maximum velocity which exists at the point A_E. The inertia due to the velocity of the constant mass $\frac{W}{g}$ deflects the spring in the opposite direction, a distance

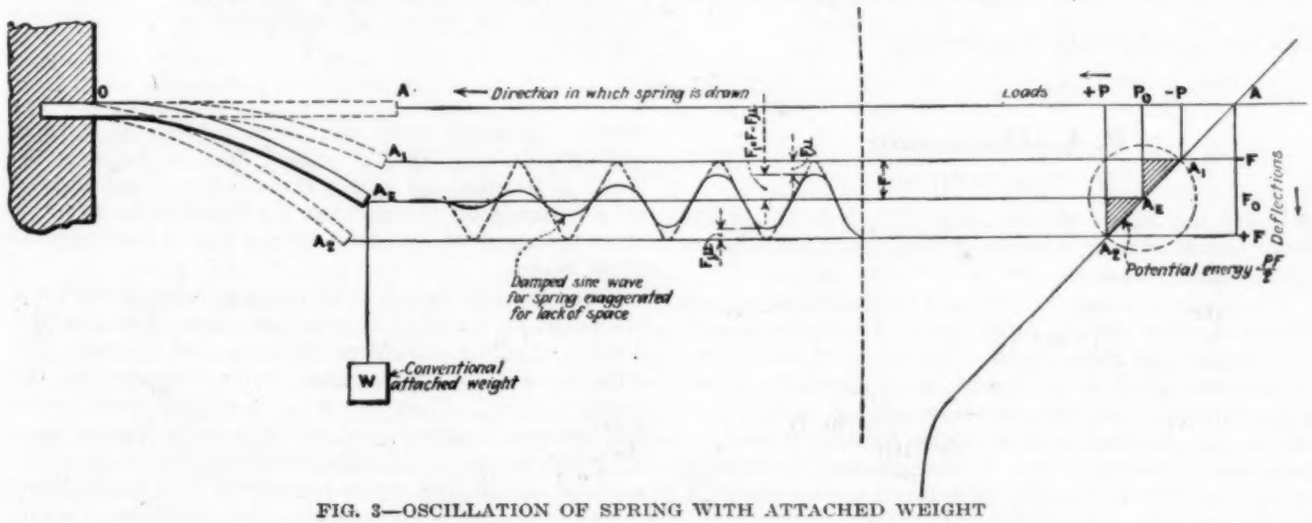


FIG. 3—OSCILLATION OF SPRING WITH ATTACHED WEIGHT

equal to F minus a very small distance, $F\mu$, due to damping, the logarithm of the fraction μ being called the logarithmic decrement.

The potential stress energy due to the deflection $F - F\mu$ is again transformed into kinetic energy which carries the spring past the position of equilibrium $A_E - A_E$, and carries it in the opposite direction a distance equal to $F_1 - F\mu - F_1\mu$. This periodic motion continues until the accumulated decrements, $(F\mu)$, $(F_2\mu)$, $(F_3\mu)$ - - - - $(F_n\mu)$ equal the amplitude F which brings the spring to rest in the position of equilibrium.

The natural damping of springs, vibrating freely as just described, is small, and has been found by experiment to be nearly proportional to the velocity. Calculations based upon this fact show that the period of oscillation remains practically constant throughout the naturally damped vibration. Equating the energies for the first oscillation, we have

Potential Stress Energy = Kinetic Energy

$$\frac{PF}{2} = \frac{WV^2}{2g}. \qquad (5)$$

For any other oscillation this equation would hold, because V would be decreased in proportion to the decrease in P due to damping. F_x is proportional to P_x, and so would also be decreased a proportional amount. Hence the percentage decrease is squared on both sides of the equation. The period of oscillation T would not be affected because F_x is proportional to V. We therefore can use expression (5) to derive the formula for the period of oscillation. Transposing (5),

$$\frac{1}{V^2} = \frac{W}{g}\,\frac{1}{PF}$$

Now referring back to the circle in Fig. 2, we have linear velocity V = angular velocity $\times F$, where the angular velocity equals $\frac{2\pi}{T}$ radians. Therefore,

$$\left(\frac{T}{2\pi F}\right)^2 = \frac{W}{g}\,\frac{1}{PF}$$

$$\text{or } T = \frac{2\pi}{\sqrt{g}}\sqrt{\frac{WF}{P}}. \qquad (6)$$

This is the period of oscillation for all springs, as well as for the particular flat spring illustrated, when a large constant load is secured to the free end, and the inappreciable mass of the spring is neglected. This formula is identical with formula (4) except that the restoring force P is derived from the elasticity of the spring material. It will be noted that the load-deflection rate $\frac{F}{P}$ appears in this formula.

For spiral and sometimes coiled springs, all the particles of the attached weight (called a balance wheel in this case) instead of oscillating through equal displacements, oscillate or gyrate through equal angles about the center of gravity, which is usually the axis of the spring. The period of oscillation for such a gyrating body may be derived as follows: In the equation preceding formula (4), we have the formula for force, and as in angular units torque corresponds to force, mass to moment of inertia, and angles to length, we may write

Torque = moment of inertia $\times\omega^2\times$ angular displacement

$$Pl = I\,\omega^2\,\theta = I\left(\frac{2\pi}{T}\right)^2\theta$$

$$T = 2\pi\sqrt{\frac{I\theta}{Pl}}$$

l = length of spring.

As $\theta = \frac{F}{l}$ approximately, and $I = \frac{W}{g}R^2$, we have

$$T = \frac{2\pi}{\sqrt{g}}\sqrt{\left(\frac{R}{l}\right)^2 W\,\frac{F}{P}}$$

where R equals the radius of gyration.

Calling the quantity $\frac{R}{l}$ the gyration factor K, we may write a general formula for the period of oscillation for springs having large attached weights,

$$T = \frac{2\pi}{\sqrt{g}}\sqrt{\frac{K^2 W F}{P}}. \qquad (7)$$

When the weight is not a gyrating mass, $K = 1$. The value of K for a balance wheel would have to be substituted, for example, in the case of the hairspring of a watch. Another example is the spiral spring which determines the period of oscillation of an electrical vibrator.

P. A.–Discussion

By Elam Whitney

Under the above title on page 337, Vol. 57, of the *American Machinist*, Charles W. Lee gives some interesting side lights.

The writer's relations to the purchasing agent are from the other side or rather from the inside, namely the engineering department. When the head of this department sends in an inquiry for information about a machine tool and the maker wires his salesman to call because he happens to be in that locality, it seems an unnecessary waste of time if the salesman is required to wait an hour or two for an interview with the P. A. before he is permitted to see the chief engineer.

In an industry engaged in manufacturing metal products the purchasing agent may have had long training in buying and selling but he is certainly not qualified to fill the position without such knowledge of small tools as would be gained, for instance, in a tool crib. Very few purchasing agents can choose small tools intelligenty from the various catalogs and they never seem to learn that button threading-dies cannot be used in holders for the hollow-mill type of threading dies, or that center drills are not the same as center reamers or that form tools should be designated as circular forming tools and form cutters as formed milling cutters. What a wide difference there is between a forming die and a threading die, yet lack of shop training on the part of the purchasing agent is often the cause of expensive delays due to confusion of these terms.

When the purchasing office receives information from the dealer to the effect that articles ordered by the production or engineering department are not in stock, substitution should not be made without consulting the proper person. Unauthorized substitution may result, for instance, in delivery of a milling cutter correct as to style but having a different sized hole than ordered, or made of carbon steel where high-speed steel is necessary.

The following is an example in which the purchasing agent was partly to blame for an error that occurred when some standard ¼ in. roughing hollow-mills were ordered. The mills were selected from a catalog which neglected to state that the roughing hollow-mills listed would cut 0.007 to 0.011 in. larger than the size given, to allow for finishing with a box tool or adjustable finishing hollow-mill. The work was to be finished with one cut and had the engineering department been conferred with, the error would not have occurred as the order would have been placed with a firm that did not make its standard mills over size.

The Organization and Management of a Medium Sized Plant

By PERCY S. BROWN
Works Manager, The Corona Typewriter Co., Inc., Groton, N. Y.

Conclusion of the article—Tools and machines—Operation control—Research to secure standards—Planning control of materials—Records for comparison and cost

ALL FACTORY experimental work is under the direction and control of the methods section of the methods division of the planning department and it is the duty of that department to devise and maintain the best methods of manufacture and procedure that can be developed or found. It accomplishes this through research work on parts, processes, materials, supplies, equipment, etc.; careful reading of technical papers and books; visits to other factories; the investigation of complaints of difficulties encountered; the maintenance of written standard practice instruments for the methods adopted, and constant contact with the results obtained from these adopted methods; through records of accomplishment; and then more detailed investigation to secure even greater benefits.

Division of Methods Work

For convenience in operation, methods work is divided into three groups, each group being under an engineer who is familiar with the particular requirements of the work in his section, and with the general policies of the company in relation to such work.

This grouping is as follows:

1. General machining of parts and their inspection.
2. General metal finishing, hardening, cleaning, chemical investigation and analysis and the inspection necessary.
3. All sub-assemblies and machine assemblies and their inspection.

The engineer at the head of a group is responsible for all methods adopted as standard in that group. He is expected to keep the work at the highest possible point of efficiency in all ways, and is responsible for the technical accuracy and completeness of the methods and processes adopted. Through this grouping and defined responsibility are found the best machines for the work; the shortest and most economical path of work; the inspection that is necessary and at what point and by whom it shall be given; the easiest and most economical method of performing the work; the operations best adapted to the work; the location of machines and work for the best results; the effect of changes in design and in tools on standard methods; the value of recommendations from operators and supervisors as to betterments; the proper small tools to use; the most economical use of supplies; the correction of troubles.

In the methods section is placed the responsibility for initiating improvements and general betterments and the following up of these ideas to the point of acceptance or rejection; and the responsibility for seeing that standard practice instructions for all work are issued, and that the results obtained from these standard methods are satisfactory in all ways.

If the methods section were operating at full theoretical efficiency it would investigate and find the best obtainable methods for securing the greatest prosperity for both company and employee; would see that the interests of both employer and employee are identical; demonstrate that by economy and the elimination of waste in materials, time and effort, a high wage can be maintained and a low production cost secured; would see that there are no wasted motions or movements; not one useless or unnecessary job performed; that there is absolutely accurate control of every operation, function and department in accordance with the best knowledge obtainable as to what is most desirable; that this knowledge is recorded and becomes a standard until some better knowledge supplants it; that this knowledge and standard is constantly utilized and applied; that proper use and application of this knowledge are fitly rewarded; and to make repeated studies and investigations of any data or information that can be used to further these objects.

Scheduling, Routing, Controlling and Dispatching

A record of all parts is kept in the parts ledger. This ledger records all parts on order, in process and in finished parts. Each part has a sheet in the ledger and in the upper right-hand corner is shown the number of parts per set and the lot size to be ordered. In the upper left-hand corner we show the lead. This lead is determined by first figuring the number of days it takes to manufacture an order of parts. The number of days multiplied by the production per day (this data being furnished by the works manager for as many months in advance as possible) plus the minimum amount for finished parts stock gives the lead, or the minimum number of parts that should be available and on order. When the quantity shown in the "Available and Ordered" column is within ten days of the minimum, the stock ledger clerk immediately issues a manufacturing order for the quantity of parts specified in the upper right-hand corner.

The manufacturing order, Fig. 11, is filled in showing starting date and finishing date. The starting date is determined from the parts ledger lead and the finishing date by adding the number of days required to manufacture the given quantity to the date on which the order is to start. The manufacturing order is then sent to

the balance of stores ledger clerk who apportions the material on the balance of stores card and then sends the order to the control board division for use in planning on the control boards. If for any reason the balance of stores clerk does not have the material required, the order is returned to the parts ledger clerk where it is filed under "Orders Held up for Material," and the balance of stores clerk immediately takes the matter up with the purchasing department in order to hasten delivery of material.

The control board clerk upon receiving the manufacturing order immediately checks up all tools and machines required for the manufacture of the order to prevent hold-ups. After he has satisfied himself that tools and machines are available for the routing of work on the control boards, he takes the machine burden record and proceeds to lay out his work on the control boards so that it will be completed on the finishing date specified on the manufacturing order.

44-8673-5m-12 21

Manufacturing Order No.

Corona Typewriter Company, Inc.

Starting Date	
To Supervisor Dept. No.	
Make—Quantity	
Part No.	
Part Name	
Finishing Date	
Material Required	Lbs.
Specifications	
Stock on Hand	S. L. Clerk
Remarks	

PARTS ORIGINATED

DATE	QUANTITY	DATE	QUANTITY

Supervisor

When complete quantity of parts are originated return this card to Route Division

FIG. 11—MANUFACTURING ORDER

Each control board consists of a number of grooves, each groove representing a part. When necessary several grooves are used for one part. At the top of the board is a calendar of all working days, each day represented by an index strip 1⅛ in. long for each day from Monday to Friday, inclusive, and 1 in. long for Saturdays. The reason for this is that ⅛ of an inch represents one hour and we work nine hours each day from Monday to Friday, inclusive, and five hours on Saturday. Long white card board strips ¾ in. high are printed with markings every ⅛ of an inch, each mark representing an hour. Every fifth mark is a heavy line for quick reference. If the first operation taken from the routine card for the given order of parts should take twelve hours, one of these strips is cut 2⅜ in. long, and the following information is placed thereon: part number, order number, operation number, machine number, quantity, and department number. This slip is then placed on the board in the groove representing the part and under the date which the machine burden record shows that the machine will be available. While it is true that we plan to a certain machine, the supervisor of a department may do the work on any machine in the group, but he must complete the work in the specified time. The control board clerk proceeds in the same manner with all operations on the order until all have been posted.

Planned Operation Lists

The dispatch clerk copies all work shown on the control board on what is known as the planned operations lists, an example of which is shown by Fig. 12. This list is sent to the department supervisor six days in advance of the time that an operation is to be started to show him just what work he will have to do in his department. These planned operation lists are made out in triplicate, one copy being sent to the supervisor of the department, one to the planning center serving that department, and one being filed for reference of the dispatch clerk. The dispatch clerk also makes out all operation cost tickets, Fig. 13, covering planned work shown on the planned operation lists and sends them with the planning center copy of the planned operation lists to the proper planning center clerk. He also sends the bills of materials, Fig. 14, for all materials to the raw material stores. The reason for sending the planning center clerk a copy of the planned operation list is to inform him of the work to be done in the department which he serves so that he may be ready to deliver it to the proper machine at the time specified. The supervisor of the department checks the planned operation lists as he completes the work, and upon completion of all work shown on any one planned operation list he returns the list to the dispatch clerk in the control board division where it is checked with the control boards to catch any error due to posting the control board or to the supervisor's incorrectly checking his list.

Operation cost tickets are made out in duplicate and are used to record time and other data for pay roll and costing purposes. Upon completion of an operation, all operation cost tickets are signed by the inspector and supervisor of the department doing the work. The inspector signs all tickets because nearly all of our work is piece work and we do not pay operators for work which they perform that is not up to standard quality. Tickets are signed by the supervisor of the department because he may find it necessary to change operations from piece work to day work. All such changes, however, must be approved by the works manager or his

251-6839-5000-8-20

PLANNED OPERATION LIST

Corona Typewriter Company, Inc.

FOLLOWING PARTS ARE PLANNED TO START TO-DAY

Dept. No..... Date.....

Part No.	Operation No. and Name, Quantity, Order No and Machine No. or Group	Tool Req. No.	Tools O.K.	Stock Req.	Oper. Ticket O.K.	Date Started Super.	Date to be Finished	Date Finished Super.
	Checked By _____							
	Routing: Route Dept.							

FIG. 12—PLANNED OPERATION LIST

assistant before day work will be paid for piece work operations. The original copy of the operation cost ticket is sent to the pay roll division of the cost department, and from there to the cost clerk. The duplicate is sent to the dispatch clerk in the control board division and all work shown as completed is posted on the control boards.

Bill of Materials

The bill of materials is made out in duplicate and is sent to the raw material stores by the dispatch clerk. The stores keeper issues the material to the department indicated and at the time specified, and then sends the bill of materials to the balance of stores clerk where it is entered on the balance of stores ledger, priced and extended, and forwarded to the cost department.

All parts are forwarded from one operation to another on parts forwarding and identification tickets, as shown in Fig. 15. Every pan of work must have one of these tickets and they must be O.K.'d by the inspector before the parts may be physically moved from a planning center. A copy of the parts forwarding and identification ticket is sent to the scheduling division of the planning department where it is filed for reference. When a manufacturing order is issued an entry is made in the parts ledger under "On Order" column. When a parts forwarding and identification ticket covers parts being forwarded from material to the first manufacturing operation, an entry is made in the parts ledger, transferring parts from the "On Order" to "In Process" column. Where parts are forwarded from the last operation to finished parts stock, we use a parts forwarding and identification ticket of a different color to facilitate sorting. All parts forwarding and identification tickets that accompany parts to finished parts stock are posted in the parts ledger and the parts are transferred from the "In Process" to the "Finished Parts" column.

All requisitions for parts from finished parts stock are sent to the parts ledger clerk and are posted in the parts ledger, deducting the quantity from the finished parts and the available and on order columns.

Assembling Operations

As previously stated assembling operations are begun in our Cortland plant. The first step in assembling is known as sub-assembling. Here we have parts requisitioned to jobs from the finished parts stock room and delivered to the jobs in standardized trays to increase operator efficiency. All operations are on piece work and highly standardized tools and fixtures are used. When the sub-assemblies are completed they are sent to the assembly stock service division where they are

Dept. No.	COST OPERATION TICKET-DIRECT LABOR CORONA TYPEWRITER COMPANY, INC.	Mfg. Order No.	Week Ending Date
Part No.	Employee No. / Name of Employee	Planned For Mach. No.	
Oper. No.	Operation Name	Reason For D.W. or Extreme Effic.	
O. K. Sup'r / O. K. Insp'r / Chkd P. C. C. / Lot Quantity / Pieces Returned / Pieces Rejected		Pieces Paid For	P. W. / D. W.
		Time	Finished / Unfinished
REG. FIN. REG. FIN. REG. FIN. REG. FIN. REG. FIN. REG. FIN. REG. FIN. REG. FIN. REG. FIN. REG. FIN. REG. FIN. REG. FIN.		Labor Rate	Efficiency / Time Per 100 Pc's
		Labor Am't	Mach. No.
		Routing: To Cost Dept. 9-9655-50m-9-22	

FIG. 13—OPERATION COST TICKET

placed in trays with other parts and are issued to the various jobs on which they are used.

Major assembly operations begin with the numbering of the frame, all frames being numbered serially. Assembly work is progressive, there being a certain number of girls or men performing the same work on a job. When a frame is numbered it is placed on a rack on the front of the work bench within easy reach of the operator and upon completion of the next operation it is placed on the next bench and so travels from one end of the room to the other so that there is a continuous flow until assembly work is completed. Up to the time a machine reaches what is known as the keyboard operation all machines are identical. Starting with the keyboard operation, however, the identity of machines is established through the stamping of an assembly card. The card is stamped to show whether it is a No. 20 keyboard, which would be a regular American keyboard, a No. 28, which would be English and so on. At the same time it is stamped to show whether it is a pica, elite, medium roman, or other type, and whether it has gothic or plain figures. When this information has been stamped on the card, the corresponding keyboard is assembled and corresponding type are soldered on after the keyboard assembly, and when the machine reaches the part final assembly, a carriage with elite spacing or pica spacing, as the case may be, is assembled to the machine.

The information which enables the keyboard job to stamp the assembly cards is received from the planning department each week, which in turn depends on the order department of the general administrative organization for the figures showing the kinds and quantities of each keyboard that are to be manufactured. The order department, of course, knows the production planned for the month, and it simply apportions orders on that basis.

Upon completion of the machines in Cortland they are placed in cases and shipped to Groton, removed from the cases and adjusted, inspected, aligned, inspected for alignment, and then sent to the final inspection and from there by belt conveyor to the stock and shipping room.

Unlike parts manufacturing the operator's time is not recorded by ringing an operator in and out on a cost ticket. Instead we have substituted the assembly card, Figs. 16 and 17, which is a card doubled over with perforated strips on the under part, bearing the number and name of each job, serial number of the machine, which the card accompanies, and place for date and clock number of the operator. As the card travels forward with the machine, the stub is filled in by the operator for the job which he performs and is torn off and retained until the end of the day when all stubs are turned into the department clerk and are carefully checked. The clerk then makes out an output report for each job and also makes out time tickets for each operator, entering the number of assemblies on the ticket corresponding with the stubs turned in. All assembling jobs are on piece work. Job inspectors, though on day work, tear off and turn in the stubs in the same way.

TO BE USED ONLY FOR MATERIAL DRAWN FROM STORES FOR MANUFACTURING ORDERS **BILL OF MATERIALS** CORONA TYPEWRITER COMPANY, INC.

STORE NO.	DELIVER TO	DEPT. NO.	PART NO.	FOR ORDER NO.

QUANTITY	UNIT	SIZE	GRADE
			6404

KIND

DATE	QUANTITY GIVEN OUT	UNIT PRICE	TOTAL VALUE

DELIVERED BY	DATE	ORDERED BY	DATE

BALANCE PER BIN TAG	POSTED TO S. L. & PRICED BY	EXTENDED BY	ENTERED ON MATERIAL SUMMARY

342-9112-2000-7-22 ROUTING-1 TO STORE 2 TO PLANNING DEPT. (STORES DIV.) 3 TO COST DEPT.

FIG. 14—BILL OF MATERIALS

On the front of the assembly card there are three strips, all bearing the machine number, the long one giving the keyboard information, the numbers and names of all jobs and providing space for the clock number of the operator, and the date. When an operator tears off and fills in a strip he also fills in his number and the date on the front of the card. After a machine has been completed on final inspection there are no strips left to be torn off on the under part of the card and all information has been filled in on the larger card on the upper section. This is then torn off, the sample of the machine's work made by the aligning inspector is

PARTS FORWARDING AND IDENTIFICATION TICKET

333-7386-100m-4-21 Corona Typewriter Company, Inc.

Order No.	Part No.	Quantity	Date

Name of Part

Oper. No.	Operation Name

Counted and Sent Out By	O. K. Inspector

Counted, Checked and Received By

From Dept.	From Oper.	To Dept.	To Oper.

This form only for Forwarding Parts between Operations and Mfg. Depts.

1. ORIGINAL. ROUTING—This copy to stay with parts until again Forwarded.

FIG. 15—PARTS FORWARDING AND IDENTIFICATION TICKET

attached and the card is finally filed in the works manager's office. Of the two remaining stubs of the card, one is forwarded to the order department when the machine reaches stock and the other remains with the machine until it has been shipped and is then sent to the order department.

All the stubs turned in by operators are sent to the planning department and are sorted and collected by

MACHINE CARD—Corona Typewriter Company, Inc.

33-100M

MACHINE DATE.....

SHIPPING ORD. NO.....KEY BOARD NO.....

SHIPPED..... TO.....

ROUTING: 1. To follow machine until shipped, 2. To Order Dept.

MACHINE DATE.....

DATE RECEIVED IN STOCK.....19

KEY BOARD NO.....REC'D BY.....

ROUTING: To be removed by Stock Clerk when machine is received and sent to Order Dept.

MACHINE DATE.....

KEY BOARD NO.....

NUMBER AND NAME OF JOB	CLOCK NO.	DATE	REMARKS
1 Feet, No. and Bushing			
3 Shift Lock, Stop, Frame, Space Bar and Key Levers			
5 Springing and Spacing			
6 Corner Posts, Segments, Typebar Rest, Links, etc.			
8 Fitting Type Bars			
9 Shift Assembly			
10 Shift Inspection			
10½ Type Bar Spacing			
11 Keyboard			
11½ Soldering Type			
11¾ Clean			
12 Part Final Assembly			
13 Final Assembly			
14 Inspection of Assembly			
15 Adjusting			
16 Adjusting Inspection			
17 Aligning			
17½ Aligning Inspection			
18 Final Inspection			
19 Align and Final Inspect.			

ROUTING: To follow machine until completed, then to be sent to the General Supervisor. MACHINE

FIG. 16—ASSEMBLY CARD—PARTS TO FOLLOW MACHINE

machine number and if any are missing a prompt inquiry is made. This insures the clearing of all machines and prevents the holding up of machines with old serial numbers. Special machines and rush orders are handled through assembling by affixing a small red rush tag to the assembly card. The assembly card is of a special size so that it will slip under the type basket of the machine without folding, thus guarding against the separation of the card from the machine and preventing confusion.

Daily records showing the individual attainment of all operators on adjusting, aligning and final inspection and of all assembly jobs are sent to the works manager and cost department. These records show the daily production, production for the week, and for the month, and the number of machines available ahead of each job. The cost department prepares a department output report, showing the number of machines ahead, completed for the day, week, and month for each assembling unit, together with quantity shipped and orders received. Therefore every executive of the company knows daily the exact status of orders, shipments and production accomplishment. From this data the string board graphics in the works manager's office are posted daily, and a close control of assembly operations can thus be maintained.

Materials are requisitioned only by the stores division of the planning department. Specifications for materials for parts designed by the designing and experimental department are furnished to the stores division and purchasing department by the methods division of the planning department. The balance of stores ledger cards used for all materials are practically identical with the Taylor balance of stores card. When the balance of stores card shows that the ordering point has been reached a requisition is made on the purchasing department in the usual way, a copy being retained for follow up purposes. However, in order to keep raw material inventories down it is the custom of the bal-

STUB TO BE FILLED OUT BY OPERATOR DOING OPERATION, TORN OFF AND SENT TO DEPT. CLERK AT END OF EACH DAY

MACHINE NUMBER	JOB	CLOCK NO.	DATE
	19 Align and Final Inspect.		
	18 Final Inspection		
	17½ Aligning Inspection		
	17 Aligning		
	16 Adjusting Inspection		
	15 Adjusting		
	14 Inspection of Assembly		
	13 Final Assembly		
	12 Part Final Assembly		
	11¾ Clean		
	11½ Soldering Type		
	11 Keyboard		
	10½ Type Bar Spacing		
	10 Shift Inspection		
	9 Shift Assembly		
	8 Fitting Type Bars		
	6 Corner Posts, Segments, Typebar Rest, Links, etc.		
	5 Springing and Spacing		
	3 Shift Lock, Stop, Frame, Space Bar and Key Levers		
	1 Feet, Numbering and Bushing		

FIG. 17—ASSEMBLY CARD—STUBS TO BE FILLED OUT BY OPERATOR

ance of stores ledger clerk to check the condition of the stock on the finished parts and parts in process string boards where the graphic inventories are carried. If it appears to him that the supply of parts in process or in finished stock is such as to warrant it, he will specify a later date for delivery on the requisition than if he were merely ordering from the balance of stores card. In most instances the clerk consults the head of the

route division before making his decision to put off the delivery date.

Upon receipt of the requisition the purchasing agent issues the purchase order. Copies of the purchase order are sent to the receiving department and stores division and one is filed by the purchasing department. The stores division, upon receipt of the purchase order, makes the proper entries on the stores ledger card and from then on follows up the order on its copy of the original requisition. The purchasing department follows up the order on its copy of the purchase order. Upon receipt of the material the receiving department issues a material received report which is stamped "Inspect" if the material is to be inspected, or not stamped if inspection is not required. This report accompanies the material to the raw material inspection department and upon completion of inspection a copy of the report is sent to the stores division and a copy to the purchasing department and one accompanies the material to the store. Upon receipt of the material in the store room the quantity accepted is entered on a bin tag. The stores division makes the necessary entries from the receiving report on the stores ledger card and the purchasing department makes the entries on the purchase order, placing the order in the permanent file if it is complete.

Disposition of Invoices

When invoices are received all copies are sent to the purchasing department for checking the price and one copy is then sent to the stores division for recording of unit price, the other is sent to the accounting department for payment. In keeping our balance of stores ledger cards we use the average system of pricing.

When a manufacturing order showing the material required is originated by the route department it is sent to the stores division which apportions the necessary material against the order and returns the order to the route division O.K.'d to show that material is available.

Raw materials are issued on a bill of materials made out in the route division of the planning department and sent directly to the raw material stores. The raw material stores deliver the material to the proper department on the date specified and record the withdrawal on the bin tag and the bin tag balance on the bill of materials and then forward the bill of materials to the stores ledger clerk where the withdrawal entries are posted on the balance of stores ledger card, the unit price of the material entered on the bill of materials and extension made, the bin tag balance shown on the bill of materials compared with the ledger balance, and investigation and correcting entries made if necessary, and the bill of materials forwarded to the cost department. Perpetual inventory is maintained on all materials by checking the bin tag against an actual inventory of bin contents. The bin tag is then corrected if necessary and is sent to the stores ledger clerk to be checked against the stores ledger card. A correcting entry is made on the card if necessary. Bin tags are checked in such quantities as to insure complete inventory of all materials at least once a year.

The same procedure is followed on supply stores as on raw materials with the exception that no string board inventory is kept of regular supply stores and a supply requisition is substituted for the bill of materials.

It has been our experience that the thorough functionalizing of the factory organization and the resulting development of close control on all manufacturing activities has brought about many economies. The control of manufacturing operations through the study of proper routing and the elimination of all unnecessary operations has resulted in lower manufacturing costs. This has been very appreciably helped by the establishment of definite and precisely understood instructions for all operations, whether piece work or day work. We are not content with securing efficiency through piece work, but we have also established control of production on day work on both manufacturing operations and detail inspection operations. By maintaining accurate records we are able to compare individual efficiencies on the same operation or on similar operations, and gradually we are establishing dependable standards for operations not on piece work as well as for those on piece work. The direct saving in labor cost through the establishment of standards and the maintenance of records has been very high, resulting in lower costs for operations and higher returns to the operator.

Control of manufacturing operations through our planning system, and especially through the functioning of the route division, has enabled us to greatly reduce process and finished parts inventories. Our stores system has had the same effect on raw material inventories, and a close control of assembling operations through the daily posting of string boards in my office has enabled us to materially reduce assembly inventories by permitting us to operate on smaller cushions between jobs.

Inasmuch as our plant operated eight years under the old line method of management and has now operated five years under the functional method of management, we have been able to definitely prove that what we have accomplished in the way of increased production and the avoidance of increased cost in the face of greatly increased wages, material costs and some expense items, could not have been accomplished under the old plan of

Welding In Railroad Shops—Whitewashing with Carbide

By Herbert Crawford

The railroad shops may be slow to adopt some new methods but they took to flame and electric welding like ducks to water. Perhaps the comparatively low first cost of the apparatus had something to do with this. The practice, however, varies widely in different shops.

Electric arc welding is the favorite in some shops for welding flues into fluesheets and the reason given is that its heat is more localized than that of oxy-acetylene. I saw the electric arc used to fill in a worm flange on a locomotive driving wheel tire. Boiler sheets were also cut to shape with the electric arc and in very good time.

When it comes to cutting in most shops the oxy-hydrogen holds the lead although oxy-acetylene also has many friends. For frame welding the oxy-acetylene is probably most used.

A byproduct of the oxy-acetylene welding outfit is the residue or sludge from the carbide. This makes a whitewash which many find very useful around the shop, particularly in the pits where regular whitewash does not stick very well. The sludge is mixed with water and usually sprayed on with air pressure, the same as whitewash. It is said to stick remarkably well.

What Is Happening to the Locomotive Industry of France?

By HENRY OBERMEYER and ARTHUR L. GREENE

Existing on old orders, government patronage and hope —No new orders in sight—Repairing locomotives after war service—Hope in electrification

THE HISTORY of France has been a history of survival in the face of apparently insurmountable difficulties. Something of this durable quality, it seems, must have extended itself to the industrial life of the country as well. From the press, from secretaries general of syndicats, and from directors of machine factories come daily reports of industrial crises fast verging on a condition of hopelessness. Every day there are more men out of work, and each day brings the big factories nearer the completion of present orders—with no repeats to follow. This, at least, is what one reads and hears. If one consents to believe even half of it, one immediately begins to wonder how and why, in the name of all that's credible, the factories manage to keep open at all. As this seemed to be a fair question, we put it to the director of the famous Chantiers de la Loire at Nantes, one of the three big factories of the Societe Anonyme des Ateliers and the manufacturer of marine machinery and locomotives. The answer resolved itself finally into three parts. In so far as the factory at Nantes is concerned, it is living on old but uncompleted orders, government patronage, and hope. Of these three factors only the last one has any prospect of surviving. But at present hope is not paying any dividends or furnishing work for the already greatly depleted personnel.

FIG. 1—ASSEMBLING PLANT FOR MARINE ENGINES, PRACTICALLY DESERTED TODAY

Let us take the three principal factors here in order. First, however, it will be necessary to examine briefly the general situation. Ordinarily the Chantiers de la Loire manufactures both marine machinery and locomotives; but only the factory at Nantes makes locomotives to any great extent. The factory at Saint-Nazaire is devoted almost entirely to work on ships. That branch of the industry has closed down. The industrial situation of France at the moment is admittedly bad, but no part of it is quite so bad as the marine department. If the Chantiers de la Loire did nothing but manufacture naval machinery it would have shut up shop long ago. It has, in fact, to all practical purposes so far as this particular part of the factory is concerned. In Fig. 1 is shown the assembling plant for marine engines, virtually deserted today. The Chantiers de la Loire at Nantes, therefore, may be considered for the moment purely as a locomotive works. Fig. 2 gives a view of the foundry for the manufacture of locomotives. Under normal conditions, the locomotive works of the plant employed approximately 3,000 men, part of whom were engaged in the construction of new engines, part on repairing and overhauling the old ones. A schedule of output was maintained of three new and six reconditioned 80-ton locomotives per month. Before the war, the cost of a new locomotive to the railroad was about one franc per kilogram. From this rate the cost has risen to its present rate of four francs and twenty-five centimes per kilogram. Such a comparison, while accurate, is hardly just. It really shows the best side of the shield, whereas the general consensus of opinion is that the worst is yet to come.

Today the personnel has been cut down to about 1,900 men, and it is even now a question how long this number will be retained. In some ways a temporary advantage is gained by the workers who are left. Working

on piecework, with very nearly the same scale of wages they received three years ago, and with the same schedule of output, many of the employees are probably making more money than they ever did. This condition, however, cannot last above a month or more, as the workers well know.

Let us return to our three factors of subsistence. The most directly profitable, but at the same time the most impermanent, is that of unfinished orders. The

FIG. 2—FOUNDRY FOR MANUFACTURE OF LOCOMOTIVES AT CHANTIERS DE LA LOIRE

Chantiers de la Loire is just completing the last consignment of an order of thirty-five locomotives begun as far back as 1914. Although founded in 1881, the factory was not extended to include the manufacture of locomotives until 1911. This, as it turned out, was a bit of unconscious prophecy. During the three years before the war, the company established a reputation for the high standard of its railroad equipment, so that by 1914 it was able to make a successful bid for the rolling stock wanted by the Paris, Lyons and Mediterranean Railroad. This bidding, it will be remembered, occurred when locomotives were down to a franc a kilogram. A view of the type of locomotive made for the railroad is shown in Fig. 3. Work had scarcely been begun on the first of the thirty-five engines when the war suddenly interfered and the factory was compelled to turn from the pursuits of peace.

It is probably not too much to say that this order has been the saving of the company, as far as the Nantes plant is concerned at any rate. Obviously, the delay caused by the war cost the railroad company dearly. On the other hand, the railway's immediate need for new locomotives was just so much the more imperative because of the intervening years. Fortunately for the Chantiers de la Loire, the railway company had no choice but to continue the order at the new increased rates. The importance of this order to the factory was not at once apparent. The short lived shipping boom that followed the war put the manufacture of locomotives into second place at Nantes, but only temporarily, however. The bottom dropped out of the shipping market with a dismaying rapidity, and the Chantiers de la Loire was thrown back on its only remaining resource.

Although the completion of the Paris, Lyons and Mediterranean order has constituted the factory's principal bank of credit for the past two years, the duration of its efficacy is very nearly over. By November, according to the present rate of progress, the last locomotive of the lot will have been delivered to its consignee. Beyond that point stretches little but a vacuum. There are no other similar orders on the books. Unless there is a sudden, marked change in conditions all around, not even the most sanguine expects or considers the possibility that any new bids will be asked for within the very near future. The railroads are holding off as long as they reasonably can, partly for signs of a dawning prosperity, partly because of the prohibitive prices in steel. They are also waiting for certain developments which we will discuss later.

In this connection it is interesting to note that the prices of iron and steel have materially risen above their prewar level in France, despite the restoration of Alsace-Lorraine. One might reasonably have assumed that the acquisition of rich coal and iron deposits in these provinces would have tended rather to have settled the market. As far as the Chantiers de la Loire is concerned, at any rate, it has been unable to profit by the increased output of steel because of the high freightage costs which have made it practically impossible for the factory to get its raw materials from that source.

It is obvious, therefore, that if the Chantiers de la Loire had only its shipping and uncompleted railroad orders to subsist on they would be in a pretty bad way. We come, however, to our second factor, government patronage. What locomotive factories like the Chantiers de la Loire lose in one direction, they make up to some extent in another. Whether or not the railroads are in the market for new stock, it still remains that they must keep going, and that on something more than papier-mâché. They must either buy new equipment or repair what they still have.

It happens that the overhauling of used locomotives has become quite a thriving industry in itself in France since the war. The war was hard on everything, but particularly so on the railroads because it exploited them of necessity for more than four years without rendering anything in return. All railroad stock in France was very seriously depleted and run down by the time the Armistice was signed, and it became one of the first cares of the government to restore it to something like normal efficiency. To some extent the French government received tardy assistance toward this end through payments in kind rendered by the Germans as one of the terms of peace. But, to exactly the same extent, the native manufacturers suffered from what amounted practically to foreign competition under the conditions of free trade. Moreover, it has been generally conceded by French engineers, that the

Germans have always been able to construct locomotives at a rate cheaper than the French rate.

This German assistance, however, amounted to little more than a drop in the bucket in comparison to the pressing and rather generous needs of the French railroads. Of the general overhauling that was required, there was enough and more to go around. The Chantiers de la Loire, therefore, received its share of the shop work, enough at any rate to employ about 50 per cent of its normal staff and to operate on a schedule of six locomotives a month.

Will Repairs Last Until Prosperity Comes?

This repair work, farmed out on an unusually large scale, has been a great boon to the locomotive manufacturers of the country. Admitting this fact does not necessarily show partiality for the particular system of government ownership which has made it possible. Neither as a temporary expedient nor as a permanent policy does government ownership enter into the question. The French, however, have a world-wide reputation, not always laudatory, of being able to preserve their machinery of all kinds in working order for a longer period than almost any other people.

It happens that the farming out of railroad repair work is a matter of government patronage; and it happens also that the government, being nominally responsible for the prosperity of the country as a whole, has placed this patronage where it will do the most good. The Chantiers de la Loire, therefore, like other factories, receives its quota of overhaulings from the government. The company fixes its own price, within certain limits. On the other hand, the work is done from first to last under the supervision of a government engineer or inspector, who is always on the job.

Were it not for this repair work, coming at such a time and in such volume, it is difficult to conceive how factories like the Chantiers de la Loire could have continued much longer without a government subsidy. But here again we find that industry is fighting for time. No figures are available, but it is readily apparent that the French railroads are in a far better condition today, so far as equipment is concerned, than they were immediately following the war. Repairs on the present scale will continue for some time to come but they will stop, except in the normal routine course of events, as soon as the railroads have made up for lost time. The time is near when the proportions of repair work will begin to decrease. The question for the Chantiers de la Loire is, which will come first, the end of the overhauling or the beginning of prosperity. Time is the essential.

Hope alone remains as a permanent investment. There are many hopes, most of them visionary, but one of them seems in the way of being realized. At least it is the subject of the moment among locomotive manufacturers. Electrification is the word. It is inevitable, they say, that sooner or later, the railroads of the world will all carry only the power unit of the coal they formerly carried in bulk. Whether France is first or last in this matter is not so important. When it comes, as it will, it will mean that long awaited thing, a boom in the locomotive industry.

As a matter of fact, however, the electrification of railroads in France may not be so far off after all, and it is on that hope that much of the optimism of the Chantiers de la Loire is feeding. Indeed, the rumor is abroad that the Paris, Lyons and Mediterranean Railroad is proposing to extend the electrification of those sections which it has already established as a matter of experiment. At any rate, the Chantiers de la Loire is preparing for such a contingency. The company is studying the best means of construction for electric locomotives, as it knows that entirely new types will have to be constructed, and is determined to be among the first in its share of the orders. All these hopes, however, are still in the future.

It remains for us now only to consider the workman. How is he faring under the present conditions? What, if anything, does he propose to do about it? The Chantiers de la Loire does not answer that, for Nantes has not been so badly hit in the matter of unemployment, as some of the other cities, especially the seaport towns of France. After November, however, when work begins to slacken, it may be necessary to discharge more men from a staff now operating on about 60 per cent of normal. Signs of approaching discontent are not lacking. One factory in Nantes, proposing a further reduction of wages, was recently accused by the workers of attempting a lockout, which nearly precipitated a sympathetic strike in the related plants of the district.

An Appeal to the Government for Work

As an example of what may happen, not only in Nantes but in other cities as well, we must turn to the seaport city of Saint-Nazaire, where one of the most unique and in some ways the most remarkable demonstrations of recent months occurred. The manifestation was utterly lacking in bolshevism, revolution or radicalism of any sort. It was held in Saint-Nazaire on Wednesday afternoon, Sept. 6, in the Place de la Gare. For several weeks preceding that date various reports had issued from the city that, with trade at a standstill, the industrial situation in Saint-Nazaire was rapidly becoming unbearable. It was not merely a matter of unemployment. The stricture was felt not only by the laborers, but by the butcher, the baker and the candlestick maker as well. All the ordinary weapons of defense possible to the worker were obviously useless. The city needed work and needed it badly. It was in no position for a protracted struggle. It turned to the government.

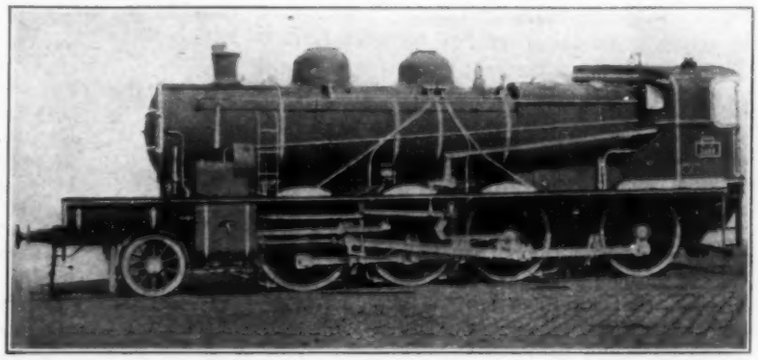


FIG. 3—LOCOMOTIVE PRODUCED BY THE CHANTIERS DE LA LOIRE FOR THE PARIS, LYONS AND MEDITERRANEAN RAILROAD

More than 10,000 persons, no small proportion of Saint-Nazaire's total population, organized by the

Union of Syndicats and the Union of Merchants in collaboration, gathered together, in orderly and quiet fashion in the public square, to address a respectful petition to the government for certain reforms which would bring work to the sorely stricken city. Every store, every shop in the town was closed for the day. There was no disorder. Employers and employees were united for once in a common cause. After a few speeches by the leaders, the crowd formed itself into a procession, with banners, and marched first to the Chamber of Commerce and then to the office of the mayor where the petition was received by the president and the mayor, respectively. It was there arranged to send an official delegation from the town to Paris to confer with members of the government on proper methods of relief. No suggestion of a threat was made, no hint of violence or disorder in any shape or form. Even the banners carried in the manifestation lacked the usual declamatory aspect. Merely the words "du travail," a demand for "work," were sufficient to express the sentiment of the moment. The terms of the petition were almost equally simple, recalling to the government certain promises which, it was alleged, had been made and not kept. It ended with a request that the government bear half of the cost of unemployment relief now being rendered by the town. The entire demonstration broke up after two hours in the same orderly fashion with which it had come together.

These things are worth mentioning, just as the occasion itself is worth celebrating, because of the contrast they furnish to the methods of the recent demonstations at Havre. The disorders at Havre, also a seaport town, sprang from much the same cause, and the strikers there were almost equally well supported by their townsmen. The difference is that in one case the demonstration was *against* the government, with resulting bloodshed; in the other it was *to* the government. These two methods are now on trial before the workers of France, and the workingmen of factories such as the Chantiers de la Loire may be expected to watch developments with a serious personal interest. In any case, Saint-Nazaire is likely to prove an excellent counterpoise to Le Havre.

Assistance Rendered Is Artificial and Only Temporary

It is just possible, of course, that we have taken too gloomy a view of the entire situation, although all of our conclusions were pretty well confirmed by those most directly concerned before they were set down. After all, the railroads cannot go on repairing their stock indefinitely to the extent they are now, and orders, not apparently imminent, may suddenly appear out of a clear sky. Again, if matters grow much worse, there is always the government, which, distastefully enough to the right side of the Chamber, may extend its paternal arm a little further. Lastly, the realization of electrically run railroads may be somewhat closer than it appears. The thing to be realized, we think, is that all three factors are more or less artificial and that only a general return to prosperity can do the locomotive industry, or any other industry in France, any lasting good.

Life Insurance in Business

According to a report issued by the Chamber of Commerce, insurance on the lives of men engaged in commerce and industry, the proceeds of which are applied to business uses, has come to be known as "Business Insurance." It is sometimes referred to as "Corporation Insurance" or "Partnership Insurance," depending on the form of organization to which it is issued.

The following illustrations indicate a few of the numerous ways in which business insurance may be adapted to create a fund for a specific purpose.

1. A small corporation, dependent upon one individual, may desire to float a bond issue. In order that investors may not be injured by the loss of this man, who is essential to the success of the corporation, endowment insurance may be taken on his life. Let us assume, for purposes of illustration, that a company needs $100,000 to enlarge its plant and extend operations. It expects to be able to repay this from earnings in twenty years. Although a sound and profitable undertaking when guided by its able executive, there is a possibility of failure if deprived of his support. Investors hesitate because of this uncertainty. However, a twenty-year endowment insurance policy for $100,000 promises to pay that sum if he is living at the end of twenty years, or at his death, in case he dies prior thereto. By assigning this policy as security for the bond issue, provision has been made for the retirement of the bonds whether he survives the endowment period, or dies previously. Naturally, bonds, mortgages, loans or other obligations thus secured are more attractive to investors.

2. When a member of a partnership reaches the age of sixty or sixty-five, he may desire to discontinue active business. Not wishing to be troubled with the uncertainties of a partnership in which he cannot participate actively, he may be desirous of withdrawing entirely. Anticipating this, the other partner could have obtained endowment insurance on his own life maturing at such a time. This will provide the funds enabling him to purchase the retiring partner's interest without forcing the sale of the business at a sacrifice. It also permits him to guide the business unhampered by an aged partner who may become ultra conservative.

3. Insurance may be taken on the life of each partner, payable to the others, to provide a fund sufficient to purchase any partner's interest in the case of his decease. Even if the survivors are willing to continue the partnership with the heirs, the heirs may not possess the requisite ability. If too progressive, they may overstep the bounds of good management with a consequent loss to the firm. If too conservative, the partnership may gradually die. It is therefore desirable from the standpoint of the heirs themselves, as well as from that of the surviving partners, that the partnership be discontinued. The purchase of insurance which provides the surviving partner or partners with funds to retire the deceased partner's interest averts the loss from a sacrifice sale, or a dissolution.

4. In time of financial depression, the bank may be unable to extend further credit to business men who they know are financially solvent. In such a stringency, the sale of securities held by the company could only be at a sacrifice, but the reserve on life insurance policies affords a ready means of obtaining cash without loss.

5. Another purpose, and a very important one, for which business insurance is utilized, is to compensate an organization for the financial loss entailed by the death of an official, expert, manager, or employee who cannot be immediately replaced. Funds may be provided by this means to offset a reduction in profits due to his death, and to pay the expenses of training a successor. Thus, the period of adjustment may be bridged over with no financial loss to the organization.

Review of Industrial Standardization for the Year 1922

By Albert W. Whitney
Chairman, American Engineering Standards Committee

The year 1922 has seen greater activity in industrial standardization than any other year in the history of American industry. Notable progress was made during the year in standardization of raw materials, of manufacturing processes, and of finished products by individual firms, by industrial and technical associations and by bodies that are working on national and international lines.

One of the most far-reaching accomplishments of the year was the organization, on a working basis, of the Federal Specifications Board which develops and approves the specifications under which all government purchases are made, and the development of a plan of co-operation between this board and the American Engineering Standards Committee; the carrying out of this plan should go far toward eliminating the difference between specifications for government purchases and specifications for ordinary commercial supplies and should thereby result in the saving of millions of dollars both for the government and for industry.

Effect of Organization of Division of Simplified Practice

The organization of Secretary Hoover's Division of Simplified Practice and its entrance into industrial field has had a highly stimulating effect on the industrial standardization movement and has helped in particular to press home to the business man that standardization is one of the main approaches to efficiency and the elimination of waste. The Division of Simplified Practice has already brought about standardization of paving brick, of beds, mattresses and springs, and of metal lath. It now has under way the standardization of lumber and other products. The distinction between the basis for this work and that of the American Engineering Standards Committee lies in the fact that the Division of Simplified Practice devotes itself particularly to that part of the field in which the decisions must be made on a non-technical basis.

Great advances have been made by industry itself on the more technical side. More than 120 standardization undertakings now have an official status before the American Engineering Standards Committee, 43 of them having been initiated within the last year; this is an increase of more than 50 per cent. Of the 28 industrial standards developed and approved by the American Engineering Standards Committee since its organization in 1918, thirteen were approved within the past year. The efforts to develop national safety codes, which have been under way for a number of years, began for the first time to bear fruit. The following six safety codes, pointing the way to the elimination of the most serious classes of industrial accidents, were approved during the year:

Safety Code for the Use, Care and Protection of Abrasive Wheels.

Safety Code for the Protection of Industrial Workers in Foundries.

Safety Code for Power Presses, Foot and Hand Presses.

National Electrical Safety Code.

Safety Code for the Protection of Heads and Eyes of Industrial Workers.

Specifications for the Testing and Use of Permissible Explosives.

Another outstanding accomplishment in the industrial standardization work of this year was the development of the "standardization-by-conference" idea, in which all of the interests involved in the subject, including producers, consumers, and representatives of the public and government, participate in deciding: first, whether standardization is to be undertaken, second, what shall be its scope, and third, what shall be its relation to other standardization work.

The year 1922 saw also the development of an increased interest in industrial standardization and an increased appreciation of its effect on production efficiency, distribution of costs, and consumer demand, on the part of such important commercial bodies as the International Chamber of Commerce, the Chamber of Commerce of the United States, and the New York State Chamber of Commerce. It is highly desirable that such co-operation should be maintained if American industry is to be given the commercial advantages which will correspond to those that are being developed through standardization in Germany and England and other foreign countries.

The Year's Progress in International Standardization

The last year saw important developments in international standardization. There are now national standardization bodies in 15 foreign countries and a report reecntly received by the American Engineering Standards Committee indicates that plans are under way for the development of such work in each of the South American republics. The most recent of the national bodies is the Australian Engineering Standards Association, which held its first meeting on the third day of November.

One of the most encouraging developments of the year has been the growth of interest in standardization and simplification among the many trade associations of America. These associations, representing large groups of producers and consumers, have extremely favorable opportunities both for developing industrial standards and for putting them into effect.

It is universally recognized that standardization is a legitimate and constructive activity of trade associations. The clarification of the legal aspects of the question by the publication in the early part of the year of the correspondence between the Attorney-General and Secretary Hoover has done much to foster and extend standardization activity among trade associations.

Ground & Sharp Screw Machines

By Wm. Klinkow

Newspaper want ads frequently are the source of much amusement and I recently ran across one that is too good not to be passed along to readers of *American Machinist*. Here it is:

> MACHINIST—One familiar with ground and sharp automatic screw machines. Apply Laurent Kelley Co., 322 Monroe St., Carlstadt.

Wonder if they're kept in the tool crib and handed out on checks? Bet the darn things are dangerous.

TABLE XV

Spain—Imports of Machinery for Working Metal, Wood or Stone

"Maquinas-terramientas para trabajar los metales, las maderas o las piedras"

Country of Origin	1909		1910		1911		1912		1913		1914	
	Kilograms	Pesetas	Kilograms	Pesetas	Kilograms	Pesetas	Kilograms	Pesetas	Kilograms	Pesetas	Kilograms	Pesetas
Canary Islands	.....	.....	.....	.....	.....	.....	14	23	.....	.....	.....	.....
Germany	851,027	1,184,210	1,085,569	1,501,598	1,134,718	1,556,347	1,450,684	1,993,264	2,220,633	3,005,367	1,283,411	1,748,241
Algiers	.....	.....	160	240	.....	.....	.....	.....	.....	.....	.....	.....
Argentina	.....	.....	.....	.....	.....	.....	.....	.....	40	65	.....	.....
Austria-Hungary	2,174	3,146	1,704	2,556	38	62	554	733	552	894	376	609
Belgium	126,649	175,662	93,588	131,115	96,791	134,837	168,245	232,198	276,667	374,219	170,666	233,252
Denmark	.....	.....	.....	.....	.....	.....	384	622	.....	.....	.....	.....
United States	43,165	59,290	118,962	163,010	76,713	102,203	992,472	1,295,186	351,887	461,785	154,596	202,911
France	467,229	657,954	347,907	493,795	569,025	798,900	597,807	835,782	719,589	987,134	458,833	634,028
Great Britain	647,064	886,492	813,776	1,110,188	326,824	440,731	364,295	492,098	494,199	671,885	371,632	501,947
Holland	943	1,276	.....	.....	1,669	2,449	13,802	19,249	16,151	21,509	5,175	7,281
Italy	10,059	15,212	7,083	9,801	8,137	11,324	17,874	26,167	32,974	44,453	24,145	34,855
Morocco (Spanish)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Norway	34,642	47,233	3,551	5,056	10,209	14,356	16,283	22,240	19,747	27,010	2,577	3,911
Portugal	6,033	8,975	22	33	153	249	103	167	73	118	1,303	1,813
Sweden	3,477	4,694	1,400	1,890	11,060	14,378	5,068	6,683	26,450	34,385	4,600	5,980
Switzerland	8,024	11,755	6,122	8,491	9,453	12,384	7,877	10,302	26,567	34,606	16,051	21,005
Other Countries	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	507	821
Totals	2,200,486	3,055,899	2,479,844	3,427,773	2,244,790	3,088,220	3,635,462	4,934,714	4,185,529	5,663,430	2,493,872	3,396,654

Par value of peseta is 19.5c.

Country of Origin	1915		1916		1917		1918		1919	
	Kilograms	Pesetas	Kilograms	Pesetas	Kilograms	Pesetas	Kilograms	Pesetas	Kilograms	Pesetas
Canary Islands	.....	.....	115	186	.....	.....	8,013	10,445	.....	.....
Germany	107,018	139,122	1,084	1,484	.....	.....	.....	.....	29,767	42,767
Algiers	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Argentina	.....	.....	3,600	4,680	.....	.....	19,569	27,435	963	1,560
Austria-Hungary	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Belgium	.....	.....	.....	.....	.....	.....	.....	.....	894	1,162
Denmark	.....	.....	.....	.....	.....	.....	282	457	191	8309
United States	642,579	843,805	2,592,993	3,422,513	3,040,651	4,016,009	286,689	387,425	1,635,708	2,199,064
France	245,730	338,559	178,098	179,684	182,334	247,710	108,895	154,682	399,881	538,960
Great Britain	501,927	672,772	678,136	920,469	314,799	424,754	303,514	414,272	868,959	1,157,072
Holland	3,996	5,524	338	548	.....	.....	.....	.....	1,591	2,577
Italy	35,805	48,346	1,033	1,674	6,331	9,053	61,432	79,862	43,959	57,147
Morocco (Spanish)	.....	.....	.....	.....	.....	.....	.....	.....	104	168
Norway	5,314	7,795	4,914	6,963	.....	.....	10,726	17,035	5,500	8,910
Portugal	310	502	12	19	30	48	1,203	1,826	.....	.....
Sweden	14,725	20,327	7,657	10,206	290	470	5,372	8,216	83,460	115,149
Switzerland	52,018	68,638	54,758	71,620	111,587	146,190	30,166	39,973	106,239	140,735
Other Countries	17,250	27,945	12,225	15,893	723	940	77	125	40	65
Totals	1,626,672	2,173,335	3,534,963	4,635,939	3,656,745	4,845,174	835,938	1,141,753	3,177,256	4,265,881

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

A Vertical-Feed Knock-Off

BY O. S. MARSHALL

The hobbing machines of a well known make formerly were equipped with an automatic knock-off for stopping the vertical feed, without at the same time stopping the rotation of the work and cutter spindles. In practice it was found that on spiral gear work the product was often spoiled, owing to the failure of the operator to bring the machine to a stop. To avoid this the knock-off was arranged to stop the motion of the work and cutter spindles simultaneously with the feed knock-off.

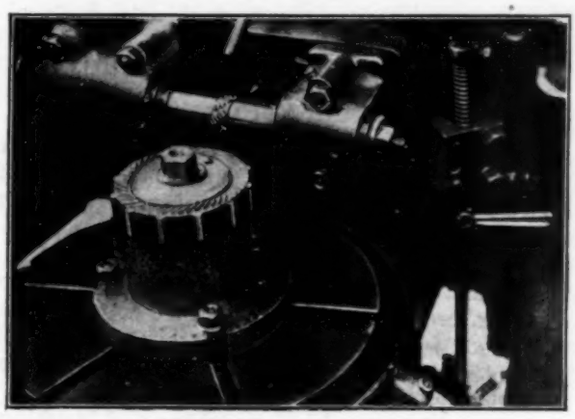


FIG. 1—JOB REQUIRING USE OF THE DEVICE

There are conditions however where it is desirable to allow the work and cutter to continue for at least one revolution after the feed knock-off has acted, or when the proper depth of cut has been reached. It was a case of this kind that led to the construction of the device shown and described herewith.

A particular job requiring the use of such a device is a tangent gear, shown in Fig. 1 in cutting position on the machine. It is similar to a crown gear in that the teeth are cut on the plane or flat side of the blank, but the teeth have a tangency of 45 degrees. There are 50 teeth, of 16 pitch. Stopping the work and cutter by the abrupt knock-off method frequently resulted in a broken hob, and always with a burred or "staked" tooth at the stopping point of the cutter.

Another job was a spiral gear with teeth cut on only a portion of the thickness of the blank, but cut the complete circumference. This gear could have been cut with a very coarse feed ($\frac{1}{2}$ in. per revolution of blank) with perfectly satisfactory results so far as the gear itself was concerned, but the regular method of stopping the feed left an unfinished end, such as happens in screw-cutting when the tool is withdrawn without stopping the progress of the lathe carriage. One full revolution of the gear-blank, after the feed stops, removes this defect and in no way injures the teeth. The rotation of work and cutter must not, however, be allowed to continue longer than this, since the teeth would be cut thinner, or gradually pared off, with every revolution of the blank.

The additional parts added for the special knock-off are shown in Fig. 2. The feed clutch to be thrown in and out is marked *A* and *B*. The clutch lever is marked *C*, and the long round rod for hand use marked *D*. This rod may either be weighted as at *E* or spring operated to insure disengagement of the clutch when the latch is released. The hand-lever which is regularly supplied on the rod *H* is removed and a new rod fitted in place of the old one, as is also a new latch, *J*, which is nicely held in swinging position by the screw *K*, and having a spring tension against the rod *H* by the coil-spring *L*. A block *M* is attached to the vertical slide, suited to carry the knock-off rod *N*. An adjustable collar *O* is provided on this rod to be set for depth of cut. Above the block *M* is another collar *P*, and a coil spring *R*, to return the knock-off rod *N* when the vertical slide is raised for a renewal of cutting operations. This rod is appropriately beveled for contact with the latch *J* so that it gradually and easily forces the latch free from its engagement in the notch provided in the clutch-controlling rod *H*.

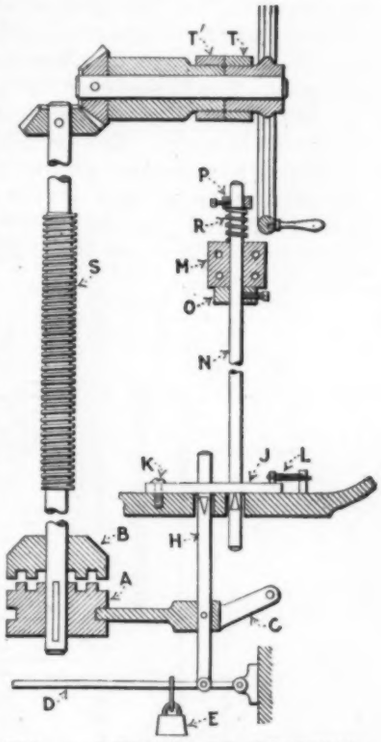


FIG. 2—DETAILS OF VERTICAL-FEED KNOCK-OFF

The vertical-feed screw is indicated by *S* on the sketch. The upper member of the clutch has a bevel gear on its upper side and is continuously driven when the machine is running. Two collars, *T* and *T'* are added in connection with the hand-wheel for determining the amount of feed. Collar T' is stationary on the housing and has a zero line scratched in a convenient position. Collar *T* is graduated in thousandths and is adjustable on the hub of the hand-wheel for setting to depth.

The vertical-feed clutch *A-B* is engaged by means of the hand-lever *D*. This lever carries upward the rod *H*, which is latched by *J* acting under pressure of spring *L*. The feed is thus locked until released by the downward-pressing rod *N*, which is carried on the descending cutter-slide by block *M*. As previously stated, there is a relieved place on the lower end of

this rod *N*, to allow latch *J* to seat itself in a notch of rod *H*, when the latter is lifted to cutting position. The collar *P*, with a spring *R*, is so placed on rod *N* as to keep the latter lifted upward, until block *M* pressing against the set-collar *O* overcomes the spring and, when the downward motion has continued until the full diameter of rod *N* has reached latch *J*, *H* is released and the clutch *A-B* is instantly disengaged, being actuated by weight *E* which is attached to levers *C* and *D*, these two parts being united firmly with each other.

The proper depth of cut must of course be determined by trial setting of collar *O*, and when determined, the movable collar *T* on the large hand-wheel may be set at zero on collar *T'*. Any deviation from the desired depth may thus be watched, and if such occurs, collar *O* may be adjusted to correct the error. This knock-off has given perfect satisfaction in every way. It does not interfere in the least with the knock-off originally furnished with the machine and which is available at any moment.

Home-Made Machine for Grinding Links

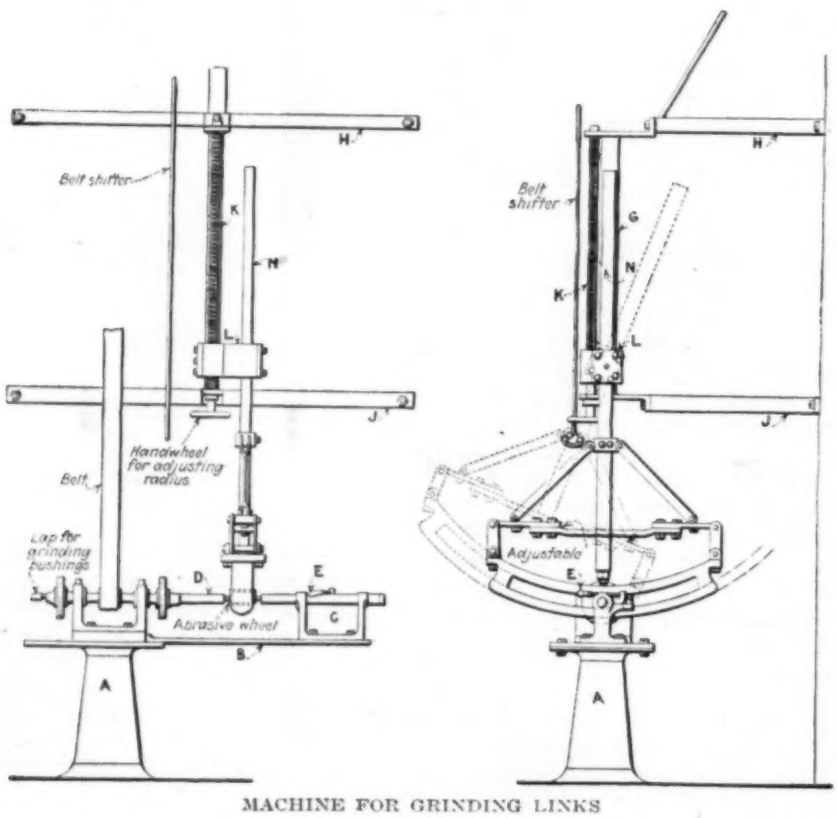
BY MATTHEW HARRIS

In small railroad repair shops link grinding is such an occasional job that it would not pay to install a special machine for the purpose. As links must be repaired at one time or another, it is up to each shop to get away with the job as best it can.

The illustration shows a link grinding machine designed and built in the Augusta shops of the Georgia Railroad. The table of a grinding stand *A* was extended by a casting *B* and the lever-operated tailstock *C* mounted thereon. The auxiliary wheel spindle was arranged to telescope in the sleeve *D*, by which it is driven through a feather. The outer end of the spindle has a collared bearing in the tailstock spindle, the arrangement allowing the spindle and wheel to be traversed back and forth by the lever *E*.

The column *G*, attached to the wall by the braces *H* and *J*, carries the screw *K* and the sliding block *L*, the latter forming the pivot from which the link is swung. The link is suspended from the bar *N* by the adjustable rigging shown. It will readily be seen that the grinding radius is controlled by the position of block *L* and that as block *L* can be moved up or down the column by screw *K*, ample adjustment is provided for links of varying radius. Adjustment for position of the link in relation to the grinding wheel is accomplished by moving bar *N* in block *L* where it can be clamped in any position.

The link is fed to the wheel by adjusting the block *L* up or down the column, while the grinding is done by manually swinging the link and its suspending rigging from the block *L* as shown by the dotted lines in the view at the right. Provision is made at the left-hand end of the wheel spindle for carrying a lap for lapping bushings.



MACHINE FOR GRINDING LINKS

Cards Assign Work to Employees

BY FRANK V. FAULHABER

A good deal of the foreman's time is taken up each day in giving the men orders, particularly in the small shop where the employees must constantly shift around. Sometimes, too, the foreman is caught unawares and has no work ready for a man that has run out of a job. One foreman has hit upon an idea that is proving a time-saver, provides work for the men for considerable time ahead, frees his mind for other responsibilities and enables his department to run much more smoothly and efficiently.

He has in charge a large punching and blanking department in which the nature of the work necessitates much shifting around. Before the installation of his system the employees would come up to his desk to inquire what to do next, thus interrupting him, while on the other hand certain employees continued on the job longer than was needful, since the work had to be distributed to keep everyone busy. The course he follows now is to hand out cards to employees stating what work to perform, the length of time to be given to it and what other operations are to follow.

Sometimes, on particularly long jobs, these cards of instructions are good for three or four days. The cards guide the employees from hour to hour, at the same time serving as reminders to produce according to percentage. They also suggest to the foreman the importance of planning ahead, which is another good feature. Since the cards have been in use there is no more cause for the foreman to say "Why didn't I take George away from that punch press before? Now Marty has nothing to do." The cards, incidentally, represent data of what each man has accomplished during a day and are useful as a guide when estimating on similar work.

Gages for Checking the Distance of a Hole from a Surface

By C. J. Dorer

When holes are being drilled and bored on a production basis, it is often desirable to know whether they are parallel to certain milled surfaces and whether they are the proper distances from these surfaces. This type of checking is sometimes very difficult, especially if the surface is not in line with either end of the hole, as was the case with the parts shown in the two accompanying drawings.

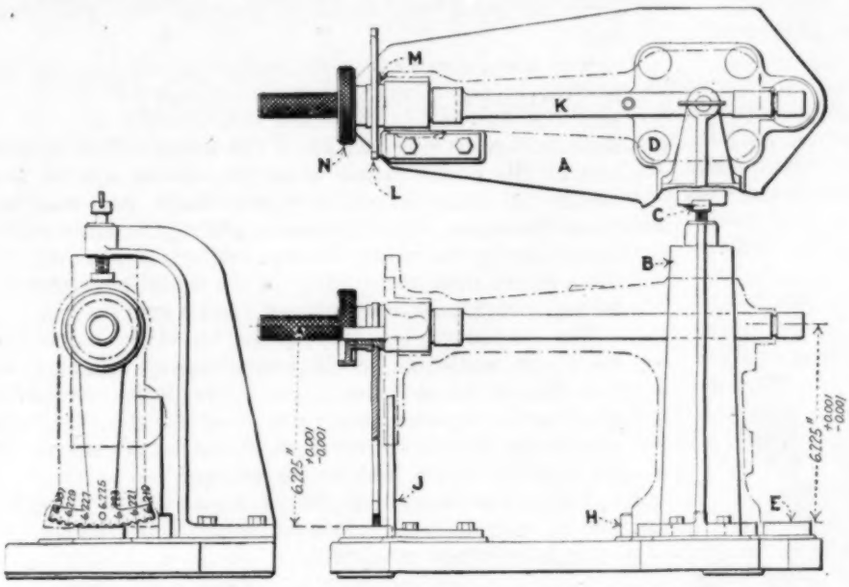


FIG. 1—GAGE WITH CLAMP FOR CHECKING OVERBALANCED PIECE

The two gages detailed are built on the same principle but are adapted to two distinctly different pieces of work. The gage in Fig. 1 is for checking the distance from the upper shaft hole to the base of a sewing machine arm. The distance is 6.225 in. and the limits are ± 0.003 in. The gage in Fig. 2 is employed for checking the distance from the lower shaft hole in the bed to the top surface of the bed of a sewing machine. The distance in this case is 1.072 in. ± 0.005 in. Both gages not only indicate any error in the location of the holes, but also register the amount of the error at either end of the hole, which determines the amount each hole is out of parallel with the measuring surface.

The gage in Fig. 1 consists of a cast-iron base *A* on which is mounted a cast-iron bracket *B*. This bracket extends over the top of the part to be gaged directly above the surface to be checked in relation to the hole. A threaded stud *C* with a floating washer attached holds the part. It gives one point of pressure on top and causes the part to rest evenly on the four buttons *D* underneath. This clamping construction is required because the casting, when standing in the position shown, is overbalanced and will not stand by itself. In the case of the gage in Fig. 2 this condition is not present, and therefore no clamping medium is necessary.

In Fig. 1, the buttons *D* are hardened steel studs and their top surfaces are ground parallel and of equal height with the two similar buttons *E*. After clamping or setting the part in place, the pin *H* and the bracket *J* serve as locating mediums and the arbor *K* is placed in the hole in the part. This arbor is made so as to be a snug slip fit in the hole and to have bearing at each end of the hole.

The checking is done by means of a hardened steel indicator. This indicator consists of a thin plate *L* which is forced over a hardened steel bushing *M* and pressed square against a flange on the bushing. The indicator is prevented from coming loose by the knurled ring *N* which is pressed on the bushing *M* tight up against the plate *L*. These three parts must be held tightly together, and the plate must be reasonably square with the hole in the bushing. This unit is a snug slip fit on each end of the shaft. In the case of the gage in Fig. 2 this indicator construction is not necessary because the distance between the hole and the surface to be checked is short. The indicator can therefore be conveniently and, in fact, more cheaply made in one piece.

After the indicator plate *L*, in Fig. 1, is assembled with the other two parts, the steps at its outer edge are ground to the proper size. The center step is ground to the normal length from the center of the hole to the surface to be checked, which surface coincides with the top surfaces of the buttons *E*. The steps to the left and right each increase and decrease in length 0.001 in. respectively. It is therefore possible to tell the amount and direction of error, if any, by swinging the indicator until it bears against the button *E* and noting which step is resting on the button. The

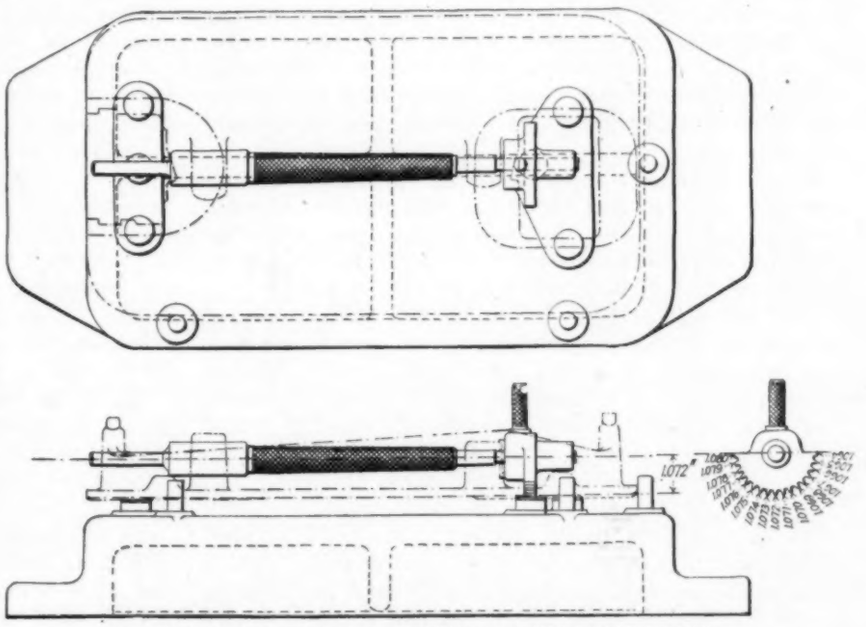


FIG. 2—GAGE FOR CHECKING A SHORT DISTANCE BETWEEN A HOLE AND A SURFACE

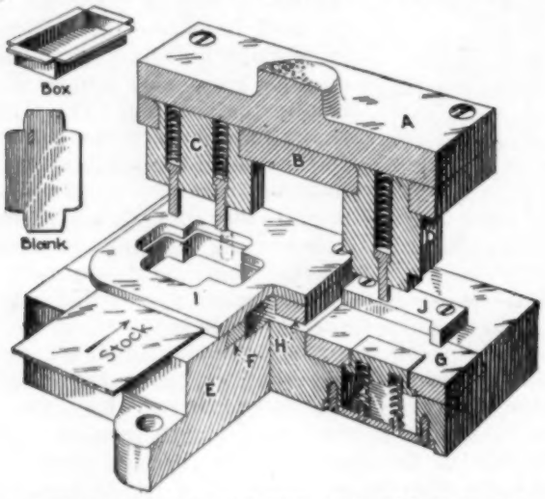
indicator can then be placed upon the opposite end of the shaft and the reading again taken. By comparing the two readings, the general direction of the hole can be determined as well as the error in distance from the surface. The reading of the gage is greatly facilitated if each step on the indicator is marked with its proper dimension from the center of the hole. Both gages are operated in the same manner.

A Two-Station Bridge Die

BY S. A. MCDONALD

One of the first questions asked by the designer when called upon for a special tool for a given purpose is, "How many pieces are wanted?" Upon the answer to this question depends the degree of elaborateness with which the details are wrought out.

In a sheet metal jobbing shop it is the practice to include the cost of the tools in the first order, leaving the usual margin of profit. Then if a repeat order comes in and the customer does not kick, the same price will be quoted as upon the first order and the jobber will stand to make a greater profit because he already has the tools.



A TWO-STATION BLANKING AND FORMING DIE

It is the writer's experience that the tools made by such shops to be used by themselves are pretty crude as compared with the job they will turn out when the tools are to go to the customer for use in his own shop; yet the product of both sets will be equally good.

The water-color box shown in the illustration had been made in such a jobbing shop in two single dies and two operations, as the orders had come in for but a few thousands at a time. After several repeat orders had been placed, the customer decided that it would be to his advantage to make the box himself, so an order was given to the shop for a set of tools. The two-station bridge die shown herewith was the result.

To the cast-iron punch holder *A* the machine steel punch plate *B* is secured by screws and dowels. In this plate are located the blanking punch *C* and the forming punch *D*. The blanking punch has two spring-operated ejector pins which push the blank through the die as soon as it is cut.

The cast-iron die shoe *E* is dovetailed to take the blanking die *F*, which is further secured in position by screws and dowels. The forming die *G* is also dovetailed into the same shoe at a lower level, so that its upper surface is on the same plane as that occupied by the blank after it has passed through the blanking die.

The forming die is fitted with a flush knockout with spring pins and backplate as shown, and there is a spring operated ejector pin in the forming punch. A cold rolled steel piece *H* supports the stripper plate *I*, which is machined with a shoulder on its under surface to act as a back guide for the stock. The two pieces *J* serve to guide the blank to position over the forming die.

The tools are used in an inclined press and the operation is as follows: A strip of painted tin is fed into the die in the direction indicated by the arrow, until it reaches the stop pin. The press is then tripped and as the punch comes down the spring ejector pins recede into the punch until the blank has been cut from the stock, when the pressure of the spring pins immediately forces the blank completely through the die and out upon the surface of the die shoe in position to move back over the forming die by gravity.

The second stroke of the press forms the blank over the forming die and, as the punch recedes from the die, the formed blank is made to follow it by the spring knockout. As soon as it is clear of the die the spring pin in the punch forces it off the latter and it is free to drop out at the back of the press.

The press is run at 90 r.p.m. and after the first stroke may be run continuously until the end of the strip of stock is reached.

Rig for Grinding Milling Cutters

BY R. C. BRITTAIN

As the proprietor of a machine shop in a small country town I am obliged to accept any job that may offer in the way of repair, from the firing pin of a shot gun to the boiler of a steam threshing machine.

Upon adding a milling machine to my equipment I soon found out that it was necessary to grind the cutters occasionally and the only thing in the shop that bore any resemblance to a cutter grinder was the machine upon which we ground lathe and planer tools and sometimes dies and other flat work that had to be surfaced. This machine had a double end wheel arbor and under one of the wheels there was a table that could be adjusted vertically but had no other movement.

To convert this machine into a cutter grinder I took the compound rest off a lathe and clamped it to the table. An Armstrong boring tool holder in the regular tool post held a short bar, one end of which was fitted to the hole in the cutters.

With the bar set parallel to the wheel arbor and before the wheel, I had movement of the cutter in three planes, parallel to the arbor by sliding it upon the bar, to and from the wheel (for feeding) by the movement of the slide rest, and vertically by means of the table adjustment.

A tooth rest, made in the usual way by splitting the end of a round rod and sweating in a piece of thin spring steel, was mounted on a small angle plate that could be clamped in whatever position upon the table that might be required, thus completing the rig.

There is nothing remarkable about the device, but it saves the price of a cutter grinder and for sharpening the small variety of cutters that I use, serves the purpose quite as well.

American Machinist
Established 1877
Kenneth H. Condit and Fred H. Colvin
Editors
January 11, 1923

Gypsum Case Decision and Trade Association Activities

THE DECISION in the case of the United States against the Gypsum Industries Association just signed by Judge John C. Knox is unique in that it says not only what this particular trade association may not do but also what it may do under the provisions of the Sherman law. As we understand the decree it is arrived at by consent and is consequently binding on the defendants.

According to United States Attorney Haywood, on whose motion the decree was approved, the decision "practically destroys the trade association and its regular weekly or monthly meetings" which provided opportunities for the abuses complained of. Judge Knox's decision will have a profound effect on every trade association and business man in the country, directly or indirectly, as it will undoubtedly serve as a precedent in other cases under the Sherman law.

While we have no criticism of any kind to make on the decision arrived at in this case we hope that in cases which may be brought affecting the interests of manufacturers of production goods such as machinery, cognizance will be taken of the fundamental differences existing between the manufacture and sale of production goods and consumer goods. The market for production goods is far more closely limited than that for consumer goods, or, as the economists have it, the demand is inelastic. As a consequence the prospect of considerable economic waste from the over-production of such goods is always to be considered.

The Gypsum decree states specifically in fourteen injunctive provisions what this particular trade association may not do. Price fixing, limitation of production by agreement, allocation of territory, control of freight rates, discrimination against or in favor of any purchaser by agreement, agreement to limit certain manufacturers to certain forms of product and blacklisting by means of credit lists are the more important prohibitions.

Lawful activities include promotion of the use of gypsum by research, publicity, advertising and educational work, maintenance of a traffic bureau to answer specific inquiries, maintenance of a credit bureau for the sole purpose of furnishing credit information, exchange of information looking to the improvement of methods of plant and mine operation including welfare work and methods of accounting.

So far as we can determine from careful reading of the decree as published in the daily papers there is no authorization for the collection of statistics on orders, stocks or relative activity. Comment on this point from the Department of Commerce will be looked for with interest.

The Need of Apprentices

THE RETURN of business in the machinery-building industries has brought out rather strongly the difficulty of securing men with sufficient training to be satisfactory. There is also a tendency to wonder where all the men have gone who manned our shops during the war.

There are probably two answers to this question. One, that many who qualified on the single operation, or special jobs, of huge war production, are unsatisfactory for the work in the average machine shop. The other, that the war wages of ten to twenty dollars per day attracted men to whom the average machine-shop wage has no appeal.

This increasing lack of skilled men is causing more manufacturers to consider the establishment of training schools or apprenticeship courses, while those who already have them are planning to increase their capacity and scope. In no other way can the country hope to maintain its supply of mechanics which has helped to make its mechanical supremacy possible.

Those who go into apprenticeship work will find conditions very different from those existing twenty years ago. Instead of a waiting list of boys eager for a chance to learn the trade with little or no pay, one of the greatest problems is to find enough boys of the right kind who want to learn it at all. Much of this is due to a false pride which has been built up against the dirt and grime of the machine shop. But a greater obstacle has been the low wage paid during apprenticeship. This has been due largely to the inability to realize the changes which have taken place in the machine industry. It is not easy to get accustomed to starting an apprentice at the rate paid a journeyman ten or twelve years ago and yet this is apparently necessary to secure boys of the right caliber.

Times have changed and we must change with them if we are to keep pace with other industries. Skilled men are necessary both on the work and as shop executives, and we must all do our share in training boys for this work.

Just Suppose

JUST SUPPOSE that there were a standard catalog size. Instead of present hit-and-miss methods of filing catalogs and never being able to find what is wanted, there would be no more trouble than in filing letters.

Catalogs are necessary and always will be. Proper get-up on a catalog will secure more business than poor get-up. And a firm must always have the privilege of having its catalogs distinctive. But it would seem that there is room enough for all to be distinctive on a page 8½ x 11 or 9 x 12. Stacked up alongside catalogs of that size what chance does a 2½ x 4¾ or a 13½ x 22 have? The first is so small that it will get lost and the other so big that there is no place to put it.

Can't be standardized? Well, perhaps not, but if twenty-five of the big concerns agreed among themselves on a size and went so far as to specify "standard size catalog" in their advertising, what would happen?—

Just suppose.

Shop Equipment News

Davis & Thompson High-Production Horizontal Drilling Machine

To meet the demand for a machine that will deliver a maximum of production on the machining of small parts, the Davis & Thompson Co., Milwaukee, Wis., has developed the horizontal multiple-spindle machine shown in Fig. 1. The machine will drill, tap, ream, thread or box-mill the opposite ends or sides of a piece of work simultaneously, and multiple heads can be used on the spindles so that several holes can be drilled at once in such work as bearing caps, connecting rods, and similar pieces within the capacity of the machine. The machine is standard except for the jigs, fixtures or other holding devices, which can be designed to suit the work. The camming can also be adjusted to the work.

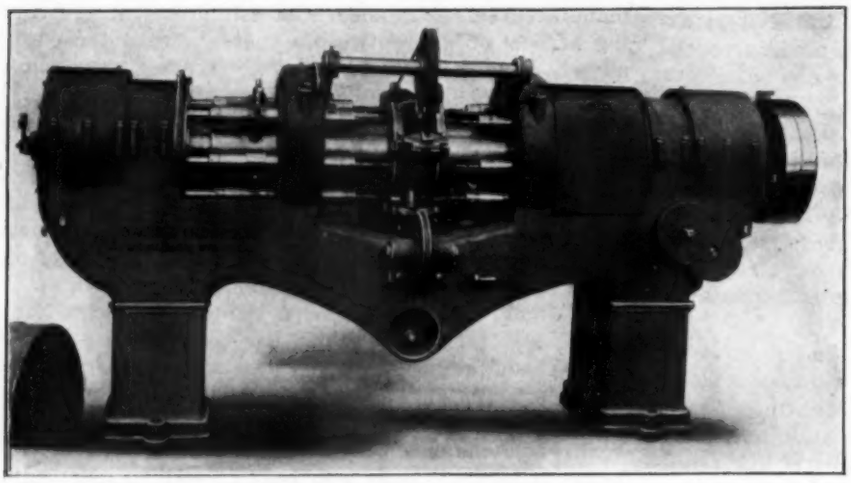


FIG. 1—DAVIS & THOMPSON HIGH-PRODUCTION DRILLING, REAMING AND TAPPING MACHINE

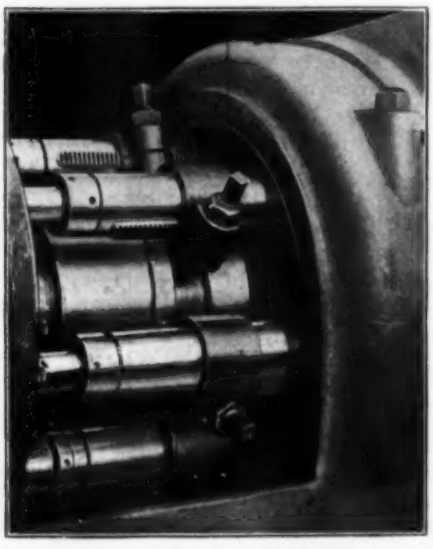


FIG. 2—SPINDLE FEEDING MECHANISM

The principal working part of the machine is the cylindrical turret, which carries the twelve work spindles and revolves continuously. The turret does not index, but the tools operate while the turret is in motion and produce twelve finished pieces with each complete revolution of the turret.

The position of each spindle can be easily adjusted by loosening the locknut shown on each collar in Fig. 2, and turning the squared-end shaft. A gear cut in the center of this shaft meshes with a rack on the spindle quill, the rack serving also as a key to hold the quill from revolving. To the lower end of each collar is attached a hardened steel roller which is actuated by a cam groove on the barrel of the machine, thus feeding the spindles in and out at the proper times as the turret and spindles revolve. The entire mechanism is gear-driven, and any desired speed of spindles or turret can be obtained. The spindle travel is 14 inches.

The barrel, or part which carries the cam, is held stationary while the turret, spindles and end plates revolve. The action is accomplished by means of the bevel gears shown in Fig. 3. A short shaft carries a bevel gear on each end, one gear meshing with the gear on the end plate and the other with the gear on the barrel. The ratio of the bevel gears is such that the barrel is held stationary when the machine is in operation and the turret revolving.

The tools are held in the spindles of the machine in the same manner as on a drill press. The work is secured by clamps that are forced in place by means of a $\frac{3}{8}$-in. steel wire cable, which can be seen best in the rear view of the machine, Fig. 4. As each piece of work passes under the cable, it is locked in place by the action of the cable on the top of the clamp, and as the turret brings the work to the front of the machine after the operation has been performed, the work is released and can be easily removed by hand.

All bearings except sheave and minor bearings are flooded with oil by means of a force pump. Lubricant is carried to the tools through the spindles of the machine, a copper tube projecting in such a manner that it revolves with the spindle and carries the lubricant to the point of the tool. When lubricant is used, it starts to flow as the tool

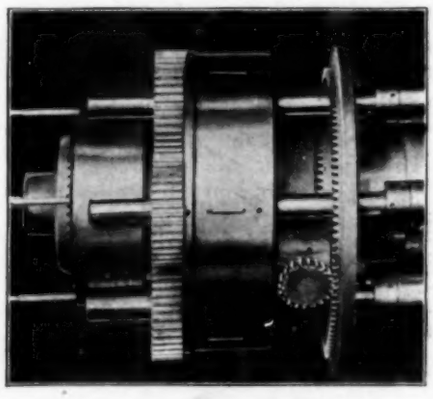


FIG. 3—PART OF DRIVING MECHANISM

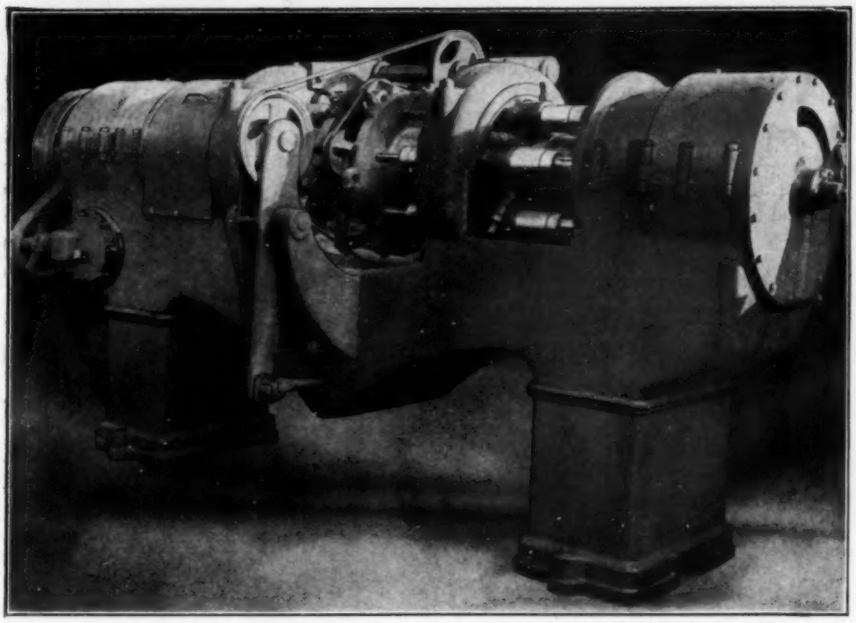


FIG. 4—REAR VIEW OF DAVIS & THOMPSON MACHINE

starts to operate, and ceases to flow when the operation is completed and the piece nears the point where it is to be removed.

Each drill bushing in the work-holding fixture turns with its drill in a second bushing which is locked into a third bushing, the third one being permanent in the machine. All the bushings are of steel, hardened and ground. All radial bearings of the machine are bronze-bushed, and the thrust bearings are ball bearings. All operating parts are ground. The spindles are of high-carbon steel.

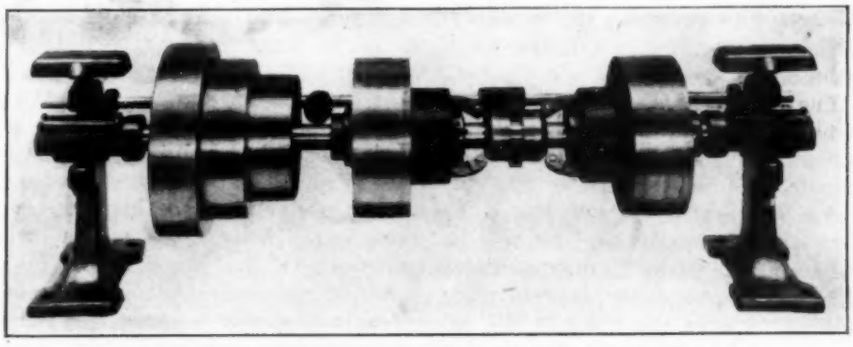
The machine is ordinarily supplied with a driving pulley, but can be furnished complete with a motor if desired. The floor space required is 4x10 ft. and the machine weighs 1,700 pounds.

Warner & Swasey Multiple Friction-Disk Countershaft

A countershaft equipped with clutches having multiple friction disks and similar to the clutches employed in automobile construction, has recently been placed on the market by the Warner & Swasey Co., Cleveland, Ohio. The clutches are adapted to high-speed manufacturing work, particularly in machines finishing brass and bronze parts where starting, stopping and reversal occur so often that the wear on the countershaft is important.

The accompanying illustration shows the general construction of the countershaft. Hardened steel plates are employed to make the contact in the clutch members. It is stated that operation of the clutches is every easy, due to the fact that the operating fingers can easily be operated by the wedge, that the disk cushions the shock of engagement, and that the Hyatt roller bearings in the pulleys reduce friction.

Although the countershaft was designed particularly for use with Warner & Swasey machines, it is also applicable to other makes of turret lathes, engine lathes and machine tools. It is made with pulley diameters of 10 and 12 in., the width of face of the pulleys being 3½ and 4¼ in., respectively. The shaft lengths are 4 ft. 4 in., and 5 ft., respectively, and the drops of the hangers 8 and 10 in. The weights with the countercone are approximately 285 and 335 pounds.

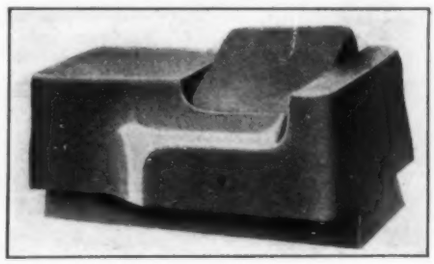


WARNER & SWASEY MULTIPLE-DISK COUNTERSHAFT

Beaudry Rocking-Face Hammer Die

A die for use on power hammers for drawing any desired taper has recently been placed on the market by Beaudry & Co., Inc., 45 Bromfield St., Boston, Mass. The accompanying illustration shows the device, which can be furnished to fit any make or size of trip, air or steam hammer.

One end of the die is provided with a tilting face so supported that it can be moved freely about a fixed axis. The operator merely shifts the position or angle of the work and strikes a light blow to adjust the tilting face to the angular position necessary. Heavy blows can then be struck to form the taper. Practically any tapered form can be completely finished and smoothed up, both on the point and on the body, without requiring any hand finishing. Only one man is needed to operate the hammer and the work, and the piece can usually be formed in one heat.



BEAUDRY ROCKING-FACE DIE

Any scale falling between the tilting face and the die-holder works into a pit through grooves and is forced down through holes in each side of the die-holder. The tilting face thus works freely at all times. The fixed horizontal surface of the die face can be used for general forging, so that the die is applicable to combinations of straight and tapered work. The die-holder is cast of gun iron, while the tilting face is forged from 60-point carbon steel.

LeBlond 25- and 27-Inch Heavy Duty Geared-Head Lathes

An improved heavy-duty lathe of the single-pulley-drive, geared-head type, has recently been placed on the market by the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. The machine, which is shown in Fig. 1, is made in both 25- and 27-in. sizes and with lengths of bed required to suit the work.

Considering the individual units of the machine, the headstock deserves first attention. It is of the selective-speed type and provides sixteen changes of spindle speed by the manipulation of two levers. All gears are made of steel, and the sliding ones of a hardened nickel alloy steel. Stub form gear teeth are employed. The shafts are short and run in bronze bearings. They are multiple splined, and the keyways in the gears are broached from the solid metal.

A 20-in. pulley carrying a 5-in. belt is employed for driving the machine, thus providing large driving power. The pulley runs on a bushing so as to relieve the drive shaft from the pull of the belt. The clutch is of the multiple-disk type and runs in oil. It is operated by a lever placed on the front of the headstock, and also by a lever on top of the carriage. Upon releasing the driving clutch, a friction brake is automatically applied to bring the spindle to rest immediately. The spindle bearings are made of bronze, babbitt lined, and are replaceable. The entire headstock mechanism is flooded with oil delivered by a submerged geared pump.

The bed is made of semi-steel, is of large depth and heavily braced to prevent deflection. The "compensating V" construction is employed for the ways. In this construction the back of the carriage travels on a flat surface, while the front of it slides on a guide, one side of which is machined at an angle of 15 deg. and the other at an angle of 70 deg. The construction provides a bearing surface normal to the direction of the forces on the tool, it compensates for the wear of both the carriage and the bed, and prevents the tendency of the carriage to climb on the ways under heavy cuts.

The speeds furnished range from 8 to 300 r.p.m. with the driving pulley running at 515 r.p.m. The spindle nose has a diameter of 4 in. and a length of 3 in., with two U. S. form threads per inch. The hole in the spindle is 2¼ in. in diameter and a No. 6 Morse taper is employed. The swing over the ways is 27½ in. for the 25-in. lathe and 29½ in. for the 27-in. lathe, the swings over the carriage being 18¼ and 20¾ in., respectively.

The tailstock is kept in alignment with the head by a V on the rear way, and it has a large flat bearing on the front way. It is provided with a set-over for turning tapers. A rack and pinion movement aids in moving the tailstock along the bed. The travel of the tailstock spindle is 12 in. With a 12-ft. length of bed, work 5 ft. 9 in. long can be held on the 25-in. machine and 5 ft. 7 in. long on the 27-in. machine.

The carriage has a large bearing surface on the ways of the bed and is held to the bed by broad flat adjustable gibs. The apron is a rectangular box consisting of a single casting and containing all the gears and shafts supported at each end. Both feeds are engaged by means of a single positive jaw clutch operated by the small lever at the center of the apron, and no friction clutch is employed. The change from longitudinal to cross feed is accomplished by means of a sliding gear operated by a knob immediately above the feed clutch. The compound rest is of the usual heavy-duty type. The cross slide is a semi-steel casting and the swivel is large in diameter. Tools ¾x1¾ in. in cross section are employed.

A feed rod separate from the leadscrew is employed in connection with a quick-change-gear mechanism. The change-gear unit is similar to those

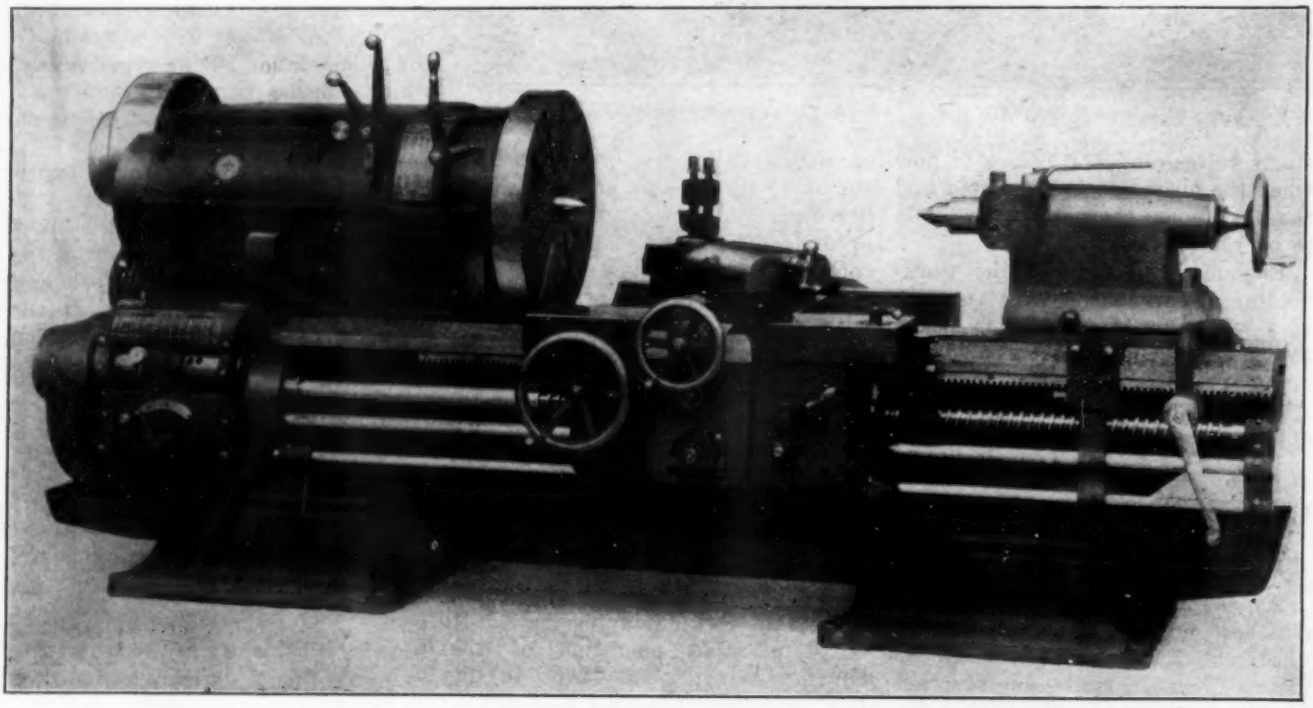


FIG. 1—LE BLOND 25-INCH HEAVY-DUTY SINGLE-PULLEY-DRIVE GEARED-HEAD LATHE

formerly employed on LeBlond machines and is mounted on the front of the bed. Forty-eight feeds are provided having a range from 0.003 to 0.184 in. per revolution, and the forty-eight threads range from 4 to 46 per inch. The leadscrew is 2⅛ in. in diameter and provided with a U. S. form thread of 1 in. pitch. A chasing dial is provided. The change gear mechanism can be furnished to cut millimeter pitches when the metric system is to be employed.

The machine is ordinarily furnished with large and small faceplates, compound rest, steadyrest having a capacity up to 8½ in., and the necessary wrenches. A taper attachment, plain block rest, turret toolpost, turret on carriage, follow rest, oil pump, pan and piping can be furnished. The taper attachment is mounted on a bracket carried on ways on the back of the bed so that it can be moved to any position desired. The attachment is intended for heavy-duty work and has a range up to a taper of 4 in. per foot. A length of 24 in. can be turned at one setting of the attachment.

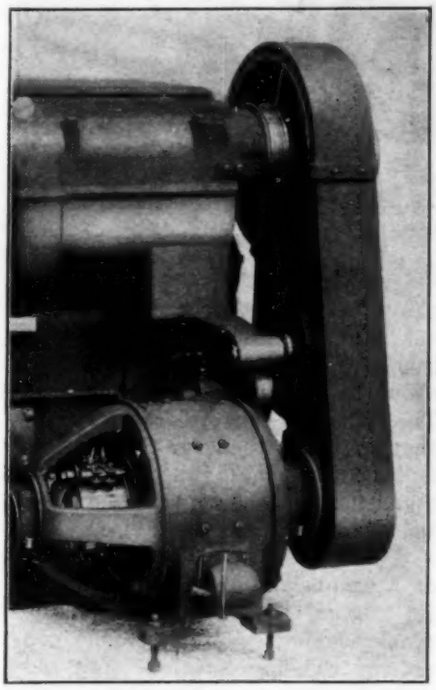


FIG. 2—MOTOR DRIVE ON LE BLOND GEARED-HEAD LATHE

Motor drives can be furnished in three types, a belted motor drive such as shown in Fig. 2, a constant-speed geared motor drive, and a variable-speed geared motor drive. In the arrangement illustrated, which is the simplest, the motor is mounted on a hinged motor plate attached to the base of the lathe, and the drive is through an endless double leather belt to the driving pulley. An idler pulley mounted on Hyatt roller bearings serves to tighten the belt and increase the arc of contact on the pulleys. Either direct or alternating current constant-speed motors with plain starting controllers are employed. The spindle is started and stopped mechanically from the apron or the headstock.

With the geared motor drive, the motor can be mounted directly on top of the headstock so as to drive through a motor pinion and an intermediate gear to a broad-face gear that replaces the driving pulley. It is possible on direct current motors, to employ a dynamic brake and start and stop the motor electrically from the apron. Variable-speed direct-current motors can be employed with automatic controllers embodying dynamic braking. In this case, the first series of gear changes in the headstock is eliminated, and the changes in speed obtained electrically. Thus, four mechanical changes with approximately twenty electrical changes provide about eighty spindle speeds. The field rheostat controlling the speeds is mounted on the headstock and the motor control is accomplished from the apron. Fifteen-horsepower motors running at 1,750 r.p.m. are recommended for constant-speed drive, and at 500 to 1,500 r.p.m. for variable speed drive.

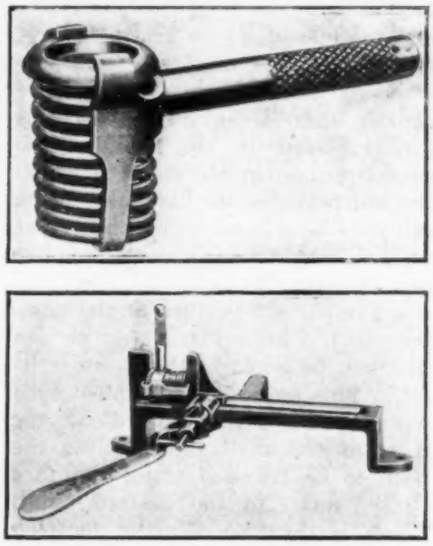
The machine complete with a 12-ft. bed weighs 10,000 lb. in the 25-in. size and 10,520 lb. in the 27-in. size. The shipping weights for the two sizes are, respectively, 11,000 and 11,600 lb. The weights for each additional 2 ft. of bed length are 490 or 510 lb., respectively.

American Tool Co. Valve Spring Compressor

A device for use in repairing automotive engines for placing the valve spring in position when reassembling the motor, has recently been placed on the market by the American Tool Co., 10 Pleasant St., Pawtucket, R. I. It consists of a compressor and a clip for holding the compressed spring.

The valve spring is first placed in the compressor, and the long handle is pulled until the spring is compressed, as shown in the view at the bottom of the accompanying illustration. The spring clip or holder is then placed over the spring, and the cross handle of the compressor turned until the spring is relieved and can be lifted from the device, as shown at the top of the illustration.

After the key has been placed in the valve stem of the motor, the valve spring in its clip is brought



AMERICAN VALVE SPRING COMPRESSOR

to bear on the key and the handle is pressed down. The clip can then be easily removed from the spring, leaving the latter in its proper place. It is stated that very rapid operation is possible and that the difficult manipulation and skinning of the knuckles that usually occurs when replacing valve springs without the use of the clip, is eliminated.

Blacker General Utility Power Smithing Hammer

A power-driven hammer intended particularly for use on forging work ordinarily performed under hand-swung sledges and too small to be done under steam hammers, is shown in the accompanying illustration. The hammer is termed a "mechanical helper," since it replaces the one or two men employed as strikers at each anvil. The same hand tools that the smith ordinarily employs are used with the hammer, without the need of special tools and dies. The hammer, which is stated to greatly increase the capacity and the output per anvil, has recently been placed on the American market by the Blacker Engineering Co., Inc., Grand Central Terminal, New York, N. Y.

The machine is rated as being able to handle material up to 2½ in. thick, although even larger sizes can be

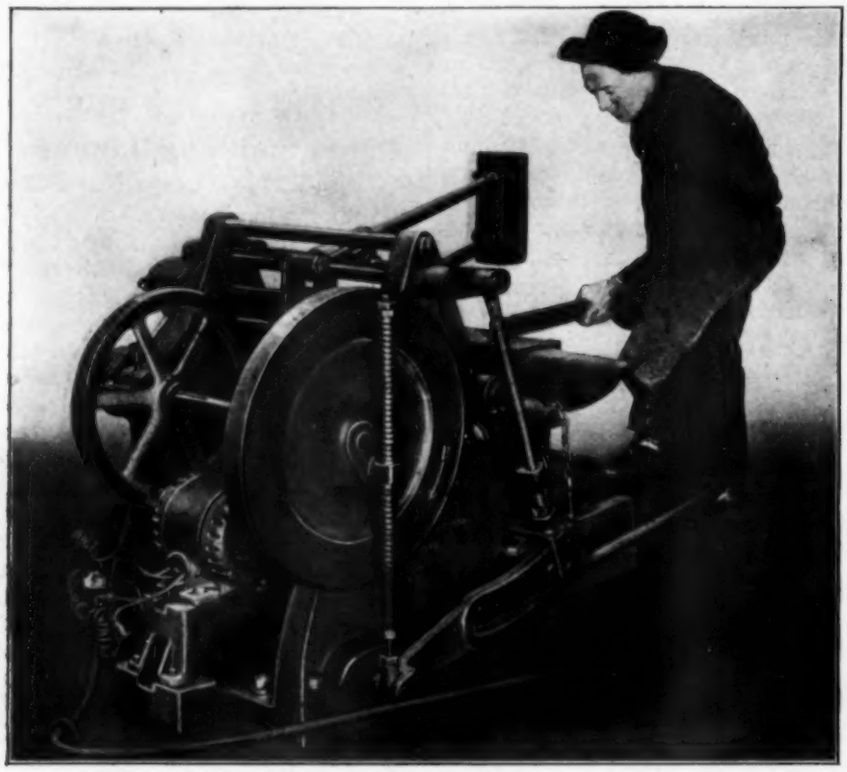
cared for. The hammer itself is under the control of the smith, so that either a light or heavy blow can be struck. The force of the blow varies directly with the depression of the treadle extending around the anvil. It is stated that the maximum blow is about four times as heavy as that delivered by a human striker, and that the machine attains a rate of 140 blow per minute. It is possible to turn out the work more rapidly than when human strikers are employed, as the limit of the capacity is set by the speed at which the smith can handle his tools. Work can thus be formed at one heat that with hand strikers would require two or more.

An important feature of the hammer is the lateral traverse motion that can be given to the hammer itself. This motion is controlled by a winged foot lever located at the right of the anvil and enabling the head to be traveled along the face of the anvil to the desired point. There is thus no delay in locating the hammer over the holes in the anvil to aid in doing swaging, punching, heading and such operations.

The work is always struck with the hammer perpendicular to the anvil, due to the way in which it is held by the parallel arms. The usual distance between the head and the anvil is 8½ in., but the stroke can be easily adjusted to suit the work. The movement of the head is very similar to that of the hand-swung sledge, as it first rises, then strikes its blow and rebounds quickly from the metal. The operator has complete control of the hammer, so that operations requiring careful work can be performed. Heavy welds, as well as the dressing of chisels, picks and articles with tapered ends, can be performed with rapidity.

An anvil and a block of special design to suit the hammer are furnished. The base of the anvil is planed and adjusting screws are provided on the stand, to enable the anvil to be moved forward or backward to get the proper position under the hammer.

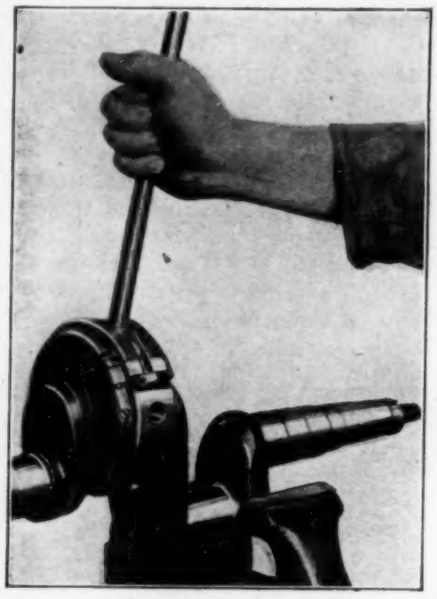
The hammer requires only 1 hp. to drive it. It can be run by means of belt from a lineshaft, being furnished with tight and loose pulleys 15 in. in diameter for this work. A more compact unit is the one driven by an individual motor, as illustrated. The motor is mounted on a small stand on the base and geared to a large driving gear placed on the main shaft. A hammer of this type does away with the necessity of overhead shafting and can be run even though the lineshaft of a shop is not in operation. The hammer alone weighs 1,300 lb., the special anvil 560 lb., and the stand 336 pounds.



BLACKER GENERAL POWER SMITHING HAMMER

Smith Crankpin Truing Device

The chief feature of a truing device intended for turning the pins of crankshafts of automotive engines, and recently placed on the market by the R. G. Smith Tool & Manufacturing Co., 245 N. J. R.R. Ave., Newark, N. J., is the fact that it is not necessary to remove the crankshaft from the crankcase in order to employ the tool. The accompanying illustration shows the device, which consists of a rigid frame that carries the cutter and is turned about the pin by means of a lever. The cutters can be reground to sharpen them whenever they become dulled. In the illustration the crankshaft is shown removed from the motor and held in a vise.



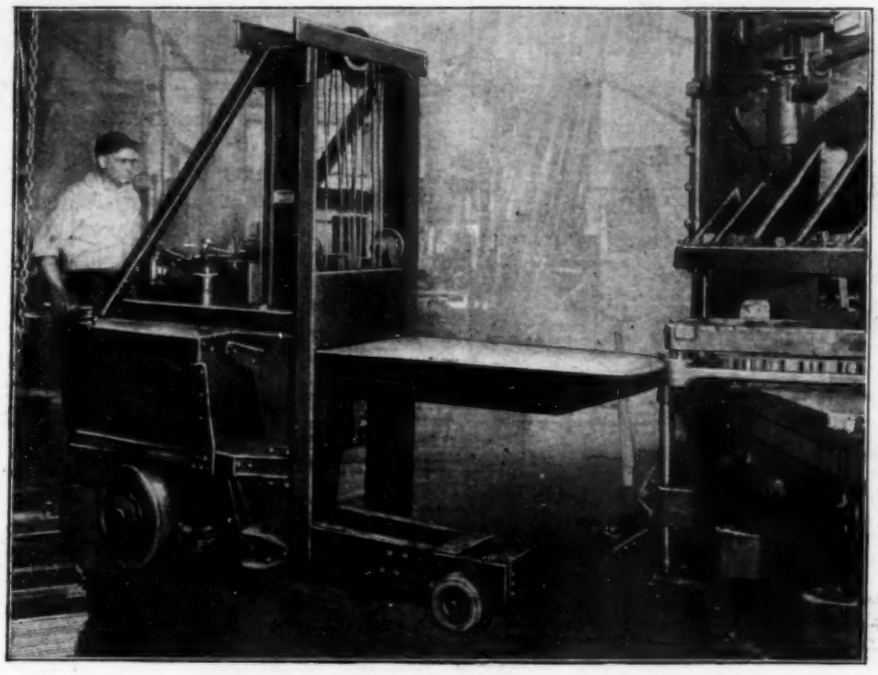
SMITH CRANKPIN TRUING DEVICE

When it is desired to true the pin of a crankshaft that is in place in its engine, the lower half of the crankcase is removed and the connecting rod disconnected. The connecting rod is then pushed up into the cylinder, and the crankpin brought down so that it is in its most accessible position. The tool is then applied by loosening the swing-bolt and opening the frame.

After the tool has been put in place, the swing-bolt is tightened and a lever inserted in the holes in the periphery of the frame is used to rotate the tool around the pin. A number of holes are provided in the device, so that the lever need not be swung through a wide arc. It is stated that a pin can be trued up in from 10 to 15 min., the tool being rotated until the pin is true.

Baker Hy-Lift Electric Platform Truck

An elevating-platform electric industrial truck that can perform the functions of a portable elevator or tiering machine, has recently been placed on the market by the Baker R & L Co., 2180 West 25th St., Cleveland, Ohio. The machine is for use where heavy materials are to be lifted, carried and stacked. The standard truck has a lift of 72 in., although it can also be furnished with lifts of 48 and 60 in. The maximum capacity is 4,000 lb., which load can be lifted at a speed of 5 ft. per minute. When lifting without load the elevating speed of the platform is 11 ft. per minute.



BAKER HY-LIFT ELECTRIC PLATFORM TRUCK

The machine is of use not only when tiering materials, but when loading them on trucks or freight cars. By the use of special types of racks, heavy materials may be stored on skids in tiers. The truck is especially useful in lifting and placing heavy dies in punch presses and in carrying them to and from the storeroom. The accompanying illustration shows the truck handling a large die for a punch press.

The truck can be used with the same skids or platforms employed for the standard elevating or lift truck, and it has the same form of units for driving, such as the motor, transmission, wheels, axles and control mechanism, that are employed on the Series C lift truck described on page 1142, Vol. 54 of *American Machinist*. Two vertical 8-in. I-beams form the track on which runs the carriage supporting the platform. Cable wound on drums is employed to lift the platform. No elevating screws or levers are used. A separate series-wound motor, having a rating of 60 amperes on 24-volt current at 1,000 r.p.m. is furnished for lifting purposes. A 40 to 1 worm reduction is used in the drive. The platform is hinged at the point of attachment to the carriage or roller head, so that the platform can be tipped up if its outer end catches and is prevented from descending when the load is being lowered.

A series-wound motor drawing 72 amperes on 24-volt current at 1,150 r.p.m. is employed for the motive power of the truck. The speed varies from 6 miles per hour without load to 4½ miles per hour when carrying the rated load. The controller supplies three speeds forward and reverse. The truck is equipped to carry 12 cells of Ironclad batteries or 21 cells of Edison batteries. All the controls are grouped to be handled from the operator's position, the steering being done by a horizontal tiller handle. The truck is provided with solid rubber tires, the power driven ones being 20x3½ in. in size and the trailing ones 10½x5 inches.

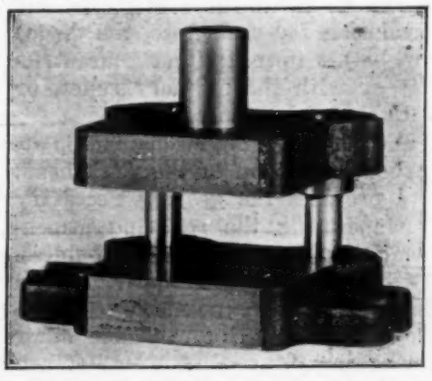
One of the chief features of the machine is the "duplex compensating suspension," by which the axles are able to adapt themselves to the contour of the road while still maintaining the proper alignment with the frame. The machine has an overall length with the operator's platform down, of 121½ in. The overall width is 38 in. and the height 100 in. The box for export shipment has a size of 350 cu.ft. and adds 1,050 lb. to the weight of the machine, which without the battery is 3,710 lb. With Edison batteries the truck weighs 4,170 lb., and with Ironclad batteries, 4,320 pounds.

Danly Standard Die-Sets for Punch Presses

In line with recent developments along the line of standardization of metal-working tools and machinery, the Danly Machine Specialties Co., 1613 N. Lincoln St., Chicago, Ill., is producing standard die-sets, made in sizes to fit all standard makes of presses. The sets are ready for the die layout, and are suitable for holding dies of practically all types.

The die-sets are made in four types, covering a large range of sizes. The one shown in the accompanying illustration is the Type B set. All die sets are equipped with leader pins to insure perfect alignment between the punch and die. This feature prevents "shearing" of the die and therefore adds to the life of the die.

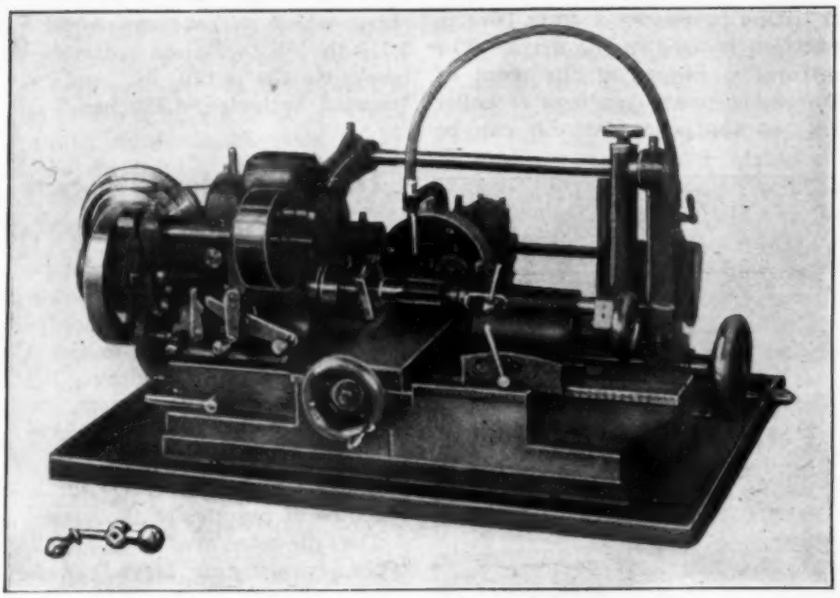
Punch-holders and die-shoes are semi-steel castings, and free from blow-holes or hard spots. Leader pins and bushings are of special alloy steel, hardened and ground to within 0.0002 in. of the listed sizes, and the bushings are lapped. All parts are tested and checked for alignment and accuracy. Replacements are easily made, as all parts are interchangeable with those of sets of the same size and type.



DANLY STANDARD DIE SET, STYLE B

Waltham Relieving Thread Milling Machine

The thread milling machine described on page 367, Vol. 55 of *American Machinist* as a product of the Waltham Machine Works, Waltham, Mass., has recently been adapted to relieving for work on



WALTHAM RELIEVING THREAD MILLING MACHINE

taps, hobs and milling cutters. The machine is shown in the accompanying illustration equipped with the relieving mechanism, which replaces the standard type of taper attachment furnished with the regular machine.

A compound taper attachment is employed; the whole attachment is arranged to travel forward and back, being actuated by a cam through levers which may be adjusted to give the desired amount of relief. Since the cam makes one revolution for each flute, the device can be set to mill either concentrically or with the ordinary relief, or with a combination of both.

A special driving mechanism is attached to the top of the work head, and provides the gearing necessary for operating the relieving attachment on different numbers of flutes. Two starting levers are provided, one being used when the machine is employed for relieving, and the other for ordinary threading work. When one is in use the other is locked in position, to prevent the engagement of both at the same time.

The compound taper attachment can be used not only for plain tapers in either direction and for straight milling, but also for a combination of straight and taper milling. The change from the straight to the taper is made automatically at any predetermined point, and is so gradual that no mark is shown on the work when the change takes place. This feature is of especial use on taps having tapered ends. Work having either straight or helical flutes can be relieved, and multiple as well as single threads can be machined. The machine can be used for a considerable variety of multiple cutter work by disengaging the gear connection from the work spindle to the screw and using an indexing device for spacing the cuts.

The machine has all the features of the regular machine, such as the constant-speed single-pulley drive, interchangeable cone pulleys for feeds, a compensating bar for varying the lead, and individual pump equipment for supplying coolant to the cut. The movements of the machine are automatically operated, and after the machine has been started, they are carried through and the machine stopped. The equipment is thus suited for production work.

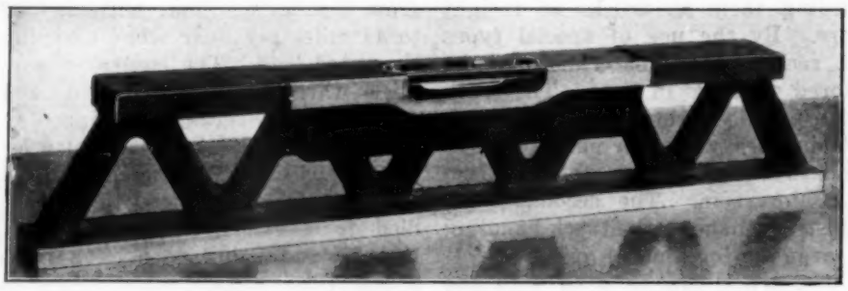
Pratt & Whitney 15-Inch Precision Level

A precision level for use in setting up machines has recently been placed on the market by the Pratt & Whitney Co., 111 Broadway, New York, N. Y. The instrument, which is shown in the accompanying illustration, is 15 in. in length and of trussed frame construction. It provides rigidity, lightness and comparative insensitiveness to temperature changes.

There are two insulating grips, one at each end of the upper member of the frame, so that it is not necessary for the operator to touch the frame when handling and thus to introduce errors due to expansion from the heat of the hands. When applying the level to the work, the thumbs of each hand grasp the insulated portions, the finger tips touch the work first and then the level is gently brought into contact.

The instrument can be furnished with different degrees of sensitiveness, depending upon the use to which it is to be put. For general shop use a 10-sec. level is employed. With this level each division of 0.1 in. indicates a variation from the horizontal of 0.0005 in. in one foot of length. This level has a radius of curvature of 170 ft., and is stated to be as sensitive as is practicable for setting up fine machine tools and doing similar work. A 3-sec. level having a proportionately larger radius of curvature can be furnished, although being very sensitive, it requires considerable time for the bubble to come to rest.

The inside of the vial is ground with a high degree of accuracy to a uniform curvature. The vial is set in metal sleeves and held in place by plaster of paris. The entire vial



PRATT & WHITNEY 15-INCH PRECISION LEVEL

mounting may be removed from the frame by taking out the four corner screws. In order to check and correct possible error in the instrument, an adjusting screw is provided on

the top of the device. A reading can be taken with the level set on a smooth surface, then the position reversed end for end and another reading taken. If the readings should differ, the adjusting screw can be turned until they agree.

It should be noted that due to the sensitiveness of the level the work should be at approximately the same temperature as the room and should not be in direct sunshine or drafts of air. Also, the operator should avoid breathing on the vial or bringing his face close to the level, because the liquid employed in the tube is very sensitive to temperature changes. A case is provided in which to keep the level when it is not in use, as it must be protected from damaging influences.

Pangborn "Shotpruf" Apron and Hood for Sandblast Operator

A heavy hood and apron for the use of sandblast operators have recently been placed on the market by the Pangborn Corporation, Hagerstown, Md. The clothing is especially resistant to wear, and has been developed particularly on account of the increasing use of steel shot and grit as the abrasive for sandblasting. Since the metallic abrasive has a specific gravity 2.5 times that of sand, it strikes the work a much harder blow without disintegration than does the sand. The rebound of the abrasive is correspondingly more wearing on the clothing of the operator; and the "Shotpruf" apron and hood that are shown in the accompanying illustration are intended to protect the operator from the damaging action of the abrasive.

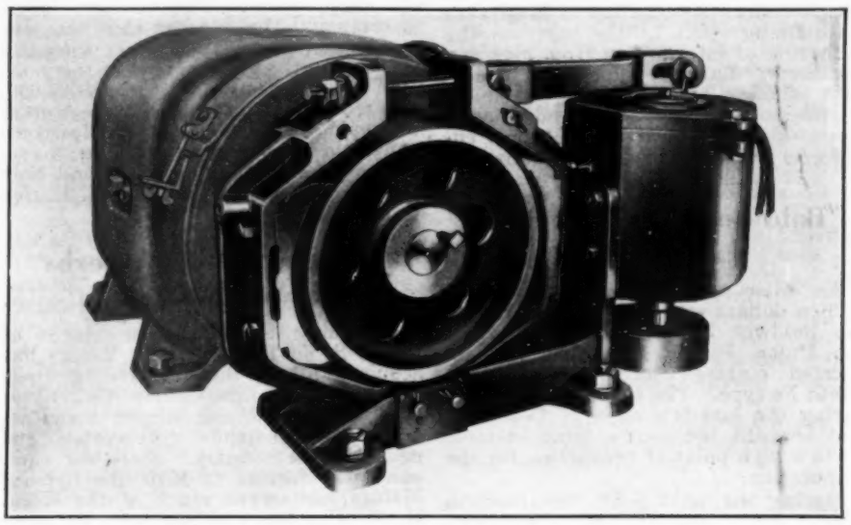
PANGBORN "SHOTPRUF" APRON AND HOOD

The front of the apron is made of chrome leather. The garment is held to the operator's legs by means of spring clips, does not bind his position, and can be easily and quickly put on or removed.

The hood is provided with a chrome-leather front and a crown that resists the wear of the abrasive. A finely woven wire screen that can be easily replaced protects the operator's eyes and given clear vision. The hood is made with the head band adjustable to fit the head of the operator.

Whiting Type-C Solenoid Crane Brake

An electric solenoid brake intended especially for crane service, and suitable for heavy-duty work in steel mills, foundries and installations requiring an automatic braking action, is shown in the accompanying illustration. The device is known as the Type-C solenoid brake and has recently been developed and placed on the market by the Whiting Corporation, Harvey, Ill.



WHITING TYPE-C SOLENOID CRANE BRAKE

The brake is of simple design and ruggedly constructed. The parts subject to stress are steel castings. All parts of the same sized brake are interchangeable, and brake wheels and shoes are interchangeable with similar parts on the standard foot brake made by the concern. The shoes are made of cast iron filled with an asbestos composition. By the removal of four capscrews, access is given to the shoes so that they can be slipped out of position for removal. The quick action of the brake arm is a feature of the mechanism. The arms are so pivoted that the shoes both bear and release equally at all points without dragging action. Uniform wear of the parts thus results.

On direct-current brakes the plunger is made of soft iron of large diameter to give a fast operating solenoid even at light loads. The solenoid spool is made of brass tubing with a vulcanized fiber sleeve over it. The coils are wound with asbestos-covered wire, and are so designed as to cause the brake to operate at about 40 per cent of the full-load current, and to remain open at 10 per cent or less of the full-load current. It is stated that the voltage loss in the coil in most cases averages less than 4 per cent and in no case more than 7 per cent.

The plunger on the alternating-current brake is of laminated iron. The coils are wound with cotton-covered enameled magnet wire sufficiently large to carry the inrush of current at the time that the coil is energized.

The maker states that the brake has been thoroughly tested, the results of the test showing that practically no wear occurred except on the brake shoes. The durability of the shoes and their ability to resist heat are shown by the statements given that the friction material was not affected when operating with the brake wheel at a dull-red heat, and that the average wear was 0.0005 in. per 1,000 stops with the motor running at 1,800 revolutions per minute.

News Section

Classifying Engineers at Nation's Request

As a part of the program of the War Department to work out plans which will enable it to make most effective use of man-power in the event of an emergency, the American Association of Engineers is compiling information as to the qualifications of individual engineers. The association recently sent out what it terms an occupational study sheet. The individual engineer is asked to furnish specified information as to his skill, education, specialties and personal qualifications.

During the war with Germany, there was great waste of skill, due to the fact that no preliminary work had been done on the classification of personnel prior to the declaration of war. It is the intention of the War Department to secure as much data as is possible on the individual qualifications of men experienced in the most needed activities. The American Association of Engineers is confining itself at the start to the gathering of information from highway engineers. Later it expects to undertake similar work among technical engineers on railroads; and among electrical, mechanical and chemical engineers, probably in the order named.

Baldwin Works Receives Large Order

An order involving approximately a million dollars was recently received by the Baldwin Locomotive Works from the Union Pacific R.R. that has requested eighteen locomotives of the Santa Fe type. The order was received during the last few days of December and brought the year's total business up to a high point of production for the corporation.

During the past year, the Baldwin Works built 704 engines. The company enters the new year with 16,000 men on the payroll as compared with 5,000 a year ago. There is estimated to be more than $44,000,000 business on the books at the present time.

Reserve Board Reports Production Gains

Contrary to the usual trend of this season of the year production in basic industries is still increasing, according to the Federal Reserve Board. Since July, 1921, states a recent report, when production was lower than at any time in recent years, there has been an almost uninterrupted rise month by month. The index, in which allowance has been made for seasonal changes, shows that production in basic industries during November was 52 per cent higher than in July, 1921, and 7 per cent higher than in October, 1922. The chief advances from October to November were in mill consumption of cotton which reached a monthly total exceeded only once since 1917, and in the production of pig iron which was larger than at any time in the past two years. Construction operations were maintained on a large scale despite the approach of winter, due to a substantial expansion in residential building.

Hendee Co. Re-Acquires Harley Co.

The Harley Co., drop forgings and castings, Springfield, Mass., has been re-acquired by the Hendee Manufacturing Co., manufacturers of the Indian motorcycle, through a foreclosure sale of the property Dec. 23. The purchase price was $625,000, the amount of the mortgage held by the Hendee concern. A few years ago the plant was sold to a company said to represent the Pennsylvania R.R. interests, the deal involving more than $1,000,000, including machinery, materials, etc. There are forty acres of land in connection with the large plant. The venture failed to command the support that was expected, and the plant has been virtually idle during the greater part of the year. The mortgage, originally for $725,000, was reduced to $625,000, but no interest was paid. Officers of the Hendee company told a representative of the *American Machinist* that no plans had been formed for operation of the Harley plant.

General Motors Absorbs Brown-Lipe-Chapin

According to the announcement of Pierre S. du Pont, General Motors has acquired all of the outstanding stock of the Brown-Lipe-Chapin Co., Syracuse, said to be the largest manufacturer of automobile differentials and gears in the country. Since the company was formed in 1910, the General Motors has owned much of the stock. H. W. Chapin, who has been the general manager of the company, has been elected president, succeeding A. T. Brown.

Standard Screw Votes 70 Per Cent Dividend

Directors of the Standard Screw Co., Hartford, Conn., voted last week to recommend to the stockholders the declaration of a 70 per cent common stock dividend. The company has $3,500,000 authorized common stock, all outstanding. A meeting of the stockholders has been called for Dec. 22.

May Transfer Export Data

The Department of Commerce is investigating the advisability of transferring to Washington the voluminous work being done on import and export figures at the port of New York. At present all import and export statistics are compiled by the Treasury Department at New York. The change would eliminate unnecessary work.

Auto Production Shows Healthy Increase

There will be needed during 1923 for replacement 1,800,000 motor vehicles, according to the annual report that has been tabulated by the Automobile Chamber of Commerce. During the past year, there were produced 2,527,000 cars and trucks and at the present time there is a registration in the United States of 11,500,000 motor vehicles out of a total of 12,750,000 in the entire world. The per cent of world registration is 81 and during the past year the registration in United States increased 7 per cent.

It is estimated that there are 40,000 motor buses in use in the United States, that street railways are using 56 motor buses and that 40 railroads use motor vehicles on short lines. The bus lines show remarkable growth within the past few years.

Kansas Industrial Court May Be Abolished

It has been announced by the newly elected governor of Kansas, according to the *Industrial News Survey*, that it is his intention to "scrap" the Kansas Court of Industrial Relations. The Court grew out of a strike in the coal fields of Kansas and was given jurisdiction to settle the point at issue and enforce its judgments. The law was broadened from time to time until it covered all industries.

The Court has been in operation since Jan., 1920, and during that time has returned forty-five decisions, forty-three of which were accepted as fair and two were disputed. However, in the recent political campaign the Industrial Court was a major issue and its abolishment was advocated by both employers and employees.

Demand for Machinery

From all indications, the demand for American machinery is increasing abroad, according to the recent commerce report of the Department of Commerce. For several weeks machinery has maintained the lead in all products that are wanted in foreign countries. Mexico seems to be first among the countries listed with specific wants for certain types of machinery.

Holiday Greetings Received

The *American Machinist* gratefully acknowledges the receipt of the season's greetings from the following:

F. X. Hooper Co., Inc., The Norma Co. of America, Barnes Drill Co., Pratt & Whitney Co., The Kempsmith Manufacturing Co., Rudolph H. Kasper, E. C. Atkins and Co., New Jersey Machine Corp., Consolidated Machine Tool Corp., Auburn Ball Bearing Co., Davenport Machine Tool Co., Inc., and the Black & Decker Manufacturing Co.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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AMONG the many reviews and forecasts sponsored by prominent business men and published in the papers at New Year's I found only one that was not confidently optimistic. It was written by Edward E. Poor, who is one of the best known dry goods merchants in New York. He says:

"The year 1923 opens with prices for cotton, wool, silk and other raw products on a high level, and this fact seems to indicate to many people that general and continued prosperity is again with us.

"Those now following charts of past conditions as guides or aids for future actions may read their various charts as indicating active and prosperous times. The Harvard Committee on Economic Research has apparently great faith that its charts indicate prosperity through the first half of the year, and leading members of the Administration are reported to believe that conditions were never brighter for a continuance of improvement in all lines of business.

"Credit will apparently be obtainable in volume on reasonable terms, but the fact has been noted in the trade that the high prices of raw materials and high wages are forcing many mills and merchants to seek financial help outside of their regular sources of supply.

"Mills are again running to capacity and are generally sold ahead for two or three months at prices which appear high, and yet do not compensate them for the present 25-cent price of cotton.

"Labor is fully employed, and in many manufacturing centers an actual scarcity exists, partly caused by the working of the laws restricting immigration. Labor is again preparing to ask for a return of the 22½ per cent which was cut from the wages in January, 1921.

"The wholesalers have been actively engaged selling to the retailers at prices below present levels, and are now replenishing their stocks at current prices, hoping that the retailers will later follow the market upward.

"The retailers are reported to have done a large business, their holiday trade having been greater than for several years, but they have been selling goods below the present level of prices, evidently believing that they could only pass their goods along to the consumer at low and attractive prices.

"The foregoing facts would seem to indicate prosperous times, but the test of whether or not we are actually to have them will come during the spring months, when the ultimate consumer is asked to pay materially higher prices, and judging by his action during the past two years he may again go on strike.

"Are we so soon losing sight of the costly lessons of 1920 and 1921, which followed, as a natural sequence, the wild boom days of 1919? With disturbed conditions throughout the world and with many disturbing questions before us in our own country, why would not all, manufacturers, merchants, jobbers and retailers, be better off and far happier by practicing 'caution' at least during the first six months of the present year."

Mr. Poor's views are quoted because he is one of the very small minority and it is generally wise to give careful attention to those who have the courage to differ from a proponderant majority.

It is an old saying that the expected rarely happens, the reason being that a thing universally expected is universally prepared for or "discounted." This probably explains why the New Year did not open with the rush that some anticipated after reading the glowing predictions of prosperity that were given out by Secretary Hoover and many others who seem to have embraced the prevalent philosophy of auto-suggestion and believe that "day by day in every way" things will improve if we but keep on saying that they are improving.

At a time of acute depression, auto-suggestion has its place and its uses in business as well as in pathology, but when every one has become optimistic we may be misled if we look only at the high lights in the picture.

The fact seems to be that we have reached a point at which any further expansion in our domestic trade is largely dependent upon an extension in our foreign trade and that the latter is in turn chiefly a question of when and how economic order can be brought out of the economic chaos that presently prevails in Europe.

This is coming to be clearly understood on both sides of the Atlantic, and therefore it was entirely natural that last week's markets should have had a good undertone as long as it appeared probable that an agreement with regard to reparations would be reached in Paris.

But on Thursday afternoon, when it was announced that the Paris conference had disbanded because an agreement upon the reparation question could not be reached, stocks, foreign exchange and most speculative commodities declined quite sharply.

That the break-up of the conference marks only a stage in the haggling that seems necessary to placate political opinion in France is generally believed in the United States. It is also believed that the compulsion of events will ultimately bring about an agreement that will be followed by a great international loan to Germany.

But action in the political drama is likely to be slow and in the interim and until Europe is financially recomposed the markets of this country will probably be alternately weak and strong.

Of these alternations, those whose judgment is unaffected by the preponderant opinion of the moment may take advantage to buy and sell, but in their operations they should always allow for the outburst of enthusiasm that is likely to follow when it is finally announced that the vexatious question of reparations has been settled.

To review the markets in detail would be to thrash old straw. In none of them have there been any striking developments. A distinct revival of activity is reported in the steel industry, and copper continues firm at 14¾ cents. The Christmas trade seems to have been good and the dry goods jobbers say that there is fair demand, though the orders are chiefly for small lots.

The cold weather has emphasized the shortage of coal in New York and New England, and the Government is again being urged to take over the coal mines and operate them. Some very large issues of new securities have been offered and sold. The weekly report of the Federal Reserve Banks shows a reserve ratio of 71.3 per cent as compared with 72.8 two weeks ago. In the same two weeks gold reserves have increased by $3,500,000 and the circulation has decreased by $45,000,000. The other changes are not important.

As January and February are generally quiet months on the Stock Exchange as well as in the retail and jobbing trades, no unusual activity is to be expected before March, unless by an unlooked for meeting of minds in Europe, American co-operation in arranging a loan to Germany shall be made possible.

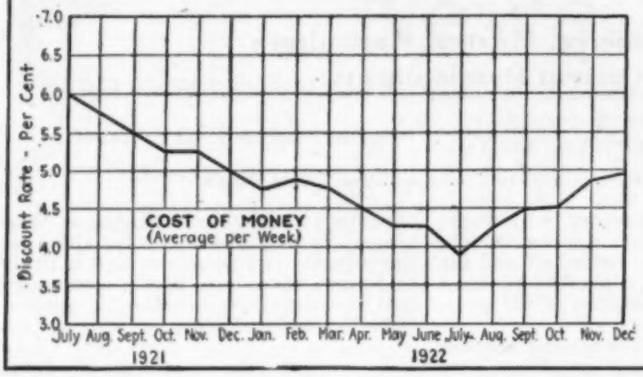
Such a contingency seems remote, but as it must occur some time it is well to be on the lookout for it.

Twelve Hour Day Too Long Engineers Find

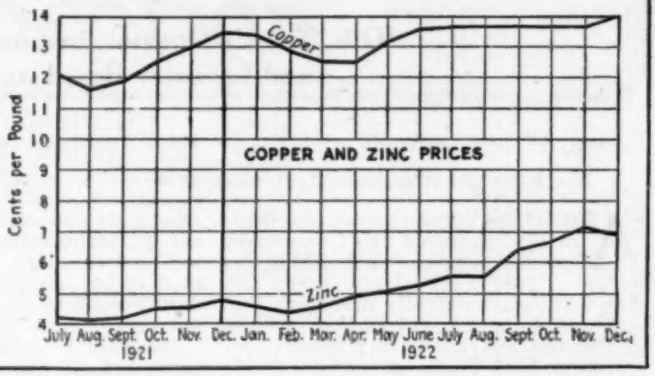
The twelve hour day and the type of worker it produces have outlived their usefulness in American life, President Harding declared recently in commenting on the report of the committee on Work Periods in Continuous Industry of the Federated American Engineering Societies. This committee after two years of investigation of more than forty continuous industries, including steel and iron, found that the twelve hour day was not an economic necessity. These findings, President Harding says, represent his social viewpoint.

In effect, the engineers found: that the tendency throughout the world was in favor of the eight hour day; that the longer work day was socially unwise and not economically necessary; that more leisure for the nation's workers does not diminish their spirit of service or their efficiency, which rather it tends to promote; that the weight of evidence in industrial plants which have changed from the twelve hour shift to the eight hour shift is in favor of the shorter day.

Average weekly rates for 60 and 90 day commercial paper based on daily New York quotations furnished by the Journal of Commerce.



Average of New York weekly quotations on electrolytic copper and zinc as reported by Engineering and Mining Journal-Press.



COST of money has remained steady for some little time and time funds were quoted at from 4¾ to 5 per cent with trades in the three, four and five months maturities at the lower figure. Not much activity was shown in the market during the latter part of December. Country banks were the principal purchasers of commercial paper and during the month a fairly good business was transacted. Choice six months names were quoted generally at from 4½ to 5 per cent. Names not so well known were quoted at from 4¾ to 5 per cent. Call loans were not in active demand and there was a wide spread in the quotations. The market, however, was considered to be in a healthy state.

Copper and zinc prices did not show any radical change during the month. Copper producers were extremely optimistic as the year closed as fundamental conditions were in excellent shape and consumption in all lines continued strong. Provisions for increased production were being made to take care of the spring trade.

Conditions are not so optimistic in the zinc market. It has not been difficult to obtain metal for both prompt and forward delivery and the premium for prompt delivery has been abandoned.

Textile industrial activity showed a marked gain over that of the same period during 1921, but the labor trouble experienced in 1921 may be held largely responsible for this condition. The woolen manufacturing industry was from 20 to 25 per cent more active in 1922 than in 1921 and the receipts of wool at Boston for the first eleven months of the year were 21 per cent greater, due to the increase of 42 per cent in domestic receipts. The price of unwashed wool which has recently been in demand at Boston advanced almost 70 per cent during the year, yarns about 50 per cent and finished goods advanced about 20 per cent.

The price of raw cotton rose about 12 per cent both to the producer and on the New York Cotton Exchange up to December 1 and further advances were made during the month. Cotton consumption rose 13.5 per cent in the first eleven months of 1922 as compared with the same period in 1921.

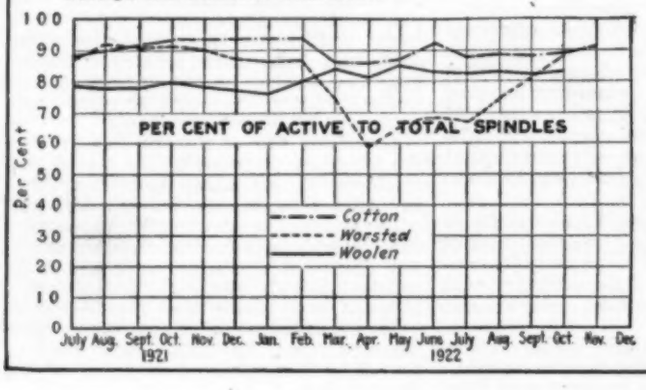
Equipment stocks recovered their former position of late fall and returned to around 110 for an average of ten stocks chosen for a comparison. It is generally conceded among authorities that all stocks are in a better condition at this time than they have been for many months past an it is anticipated that this state of affairs will remain for several months to come. Heavy trading during December and the latter part of November was largely responsible for the condition in which stocks are found today. Factory activity and production are also factors that have aided the condition. Big orders were received by locomotive manufacturers during the latter part of December and other industries prospered in a like manner during the last month of 1922.

Comparative Prices of Shop Supplies

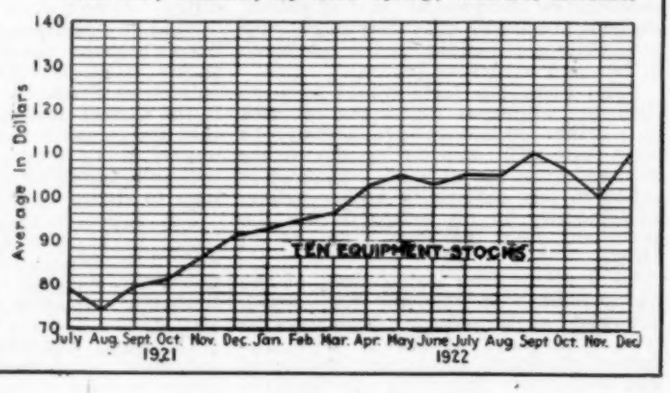
Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb.	$0.0296	$0.0295	$0.061
Cold finished shafting.....	per lb.	0.0378	0.0318	0.035
Brass rods.....	per lb.	0.1742	0.171	0.155
Solder (½ and ½)	per lb.	0.2425	0.24	0.2125
Cotton waste..	per lb.	0.1175	0.11	0.103
Washers, cast iron (½ in.)...	per 100 lb.	4.33	4.33	4.50
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100	2.96	3.11	.....
Lard cutting oil	per gal.	0.5583	0.59	0.55
Machine oil....	per gal.	0.36	0.36	.....
Belting, leather, medium.....	off list	49%	37%	51%
Machine bolts up to 1 x 30 in.	off list	51⅛%	55%	60%

Monthly percentage of active cotton, woolen and worsted spindles to the total in place as reported by the Bureau of Foreign and Domestic Commerce.



Monthly average: Am. Brake Shoe; Am. Car and Fdy.; Am. Loco.; Baldwin; Lima Loco.; N. Y. Airbrake; Pressed Steel Car; Pullman; Ry. Steel Spring; West'h'se A'Brake.



German Conditions Remain Problematical

Difficulty in Determining Exact Financial Status of Operating Companies—Powerful Trusts Much in Evidence—Foreign Capital Supporting Big Industries—Improvement in Markets Noted

By Our German Correspondent

THE LAST statement upon Germany's national finances is a document of sinister import. Expenditures of the state have grown immensely. From April 1 to the end of November they amounted to 117,444 million marks, of which only an eighth part is covered by revenue. A deficit of at least 800,000 million marks is expected to have accumulated at the end of the year. The national indebtedness has within two months almost doubled, having on November 20 passed the billion mark level. The appalling speed, by which the inflation has increased and is still increasing, has no equal in European history, with the exception of the speed of inflation in Russia and Austria, to whose fate German developments are now bearing more and more resemblance. The whole state revenue in October was 55,000 million marks, the expenditures 175,000 million marks. Since pre-war times the state revenue has increased 207 times, expenditures 1665 times, and in the race between the two, the former is outdistanced at an ever increasing extent. It is not difficult to see, that, if radical steps are not taken, Germany will within half a year, as a safe estimate, arrive at the level Austria is occupying now.

Industry Now Important

In the great problem of checking the further downslide and arriving at an eventual recovery, industry is again coming strongly to the fore-ground. Being the sole factor in Germay's economical life, which so far has retained a measure of strength, it occupies a more powerful position than ever before. The all important part assigned to industry in the scheme of things to come is not properly understood outside of the country. German industry has become a compact body elaborately and firmly organized in every detail. All single associations of manufacturers are linked together in groups under head organizations for each line of manufacture, which in turn have a central organization in the national association. For instance, the head organization of the machine building industry is the association of German machine builders, in which all branches of the machine building industry are represented. The semi-official functions now vested in the manufacturers associations, especially with regard to export control, have greatly increased their power, making membership of individual manufacturers almost compulsory.

The national organization of German industry has thus become the most powerful institution in Germany, paralleling if not exceeding the power and authority of the government. It is a fact that the direction of its policy rests practically with a handful of men, each representing huge combined interests. The enormous progress of vertical trustification has practically delivered the German industry to a few industrial octopuses.

The instance of Germany's greatest vertical trust, the A.E.G. (General Electric Company) combine gives a striking illustration. This combine rests on the one side upon large coal mines and steel works and reaches on the other side up into as great a variety of finished manufacture as is conceivable. It comprises cable works and cable operating companies; it is a member of one of Germany's largest locomotive and railway car trusts; it has a large interest in a porcelain manufacturing combine; together with the Siemens combine it controls incandescent lamp manufacture; in conjunction with Krupp and another large combine it has assumed complete control over Germany's second largest machine building works, the Rhenish Metal and Machine Works; outside of the country it has bought one of Australia's largest state works. These are only a few instances of this combination's enormous variety of interests. There is hardly a line of manufacture into which it has not extended its fangs. A multitude of small individual manufacturers is dependent on it. The same applies, although in a varied degree, to the other vertical trusts. All of them are linked together by a community of interests. Rivalry having been practically eliminated during months of an unparalleled boom, there exists almost nothing which could act as an element of conflict.

The growth of vertical trustification must, apart from other reasons, be attributed in a large measure to the shortage of working capital, the German money market being not nearly sufficient to supply the enormously increased needs. In consequence the industry has become more and more dependent on foreign capital. The latter is drawn chiefly to the large and most powerful concerns. There is hardly one of them left, which is not supported by foreign capital. This is as a rule done through German nominees, behind which the real powers are sometimes veiled so effectively that even the management does not know who and of what nationality the new holders of control are.

Of the financial state of German industry two strictly opposing opinions prevail, the one speaking of most flourishing conditions, the other declaring this prosperity to be a mere sham. The real condition probably keeps the middle line. The huge profits figuring in the balance sheet of the various companies are, of course, purely deceptive. In this connection it may be mentioned that it is actually suggested that the German companies should make out their profits in gold marks, in order to disprove the magnitude of wealth they are suspected of accumulating inside and outside of the country. If the visible profits are small expressed in gold, it is a fact that most German companies have large hidden reserves, which largely exceed in most cases the stated profits. As an instance may be quoted here the balance sheet of Germany's largest machine tool works, J. E. Reinecker A.—G., Chemnitz, for their business year ending in June, 1922, just issued, and who are reputed as one of the most conservative and prosperous independent firms.

Stock	M 30,867,490	M 15,147,122	M 7,175,792
Bank account	25,611,886	15,984,505	5,013,344
Creditors	28,963,017	11,755,815	17,903,397
Payments on account	15,309,137	1,775,016	6,314,715
Liabilities	31,490,406	8,914,905	8,107,755

Of the profit and loss account may be mentioned the following items:

	1921/22	1920/21	1919/20
Profit	M 16,665,394	M 9,982,144	M 10,310,518
Overhead	.....	.....	.....
Taxes, donations to employees welfare and social levees	6,172,811	3,296,748	6,654,636
Writing off	632,282	1,039,131	839,442
Net profit	9,860,301	3,646,265	2,816,440
Dividends	9,600,000	4,800,000	2,400,000
Reserves	.....	48,000	24,000

BALANCE SHEET OF J. E. REINECKER, MACHINE TOOL WORKS

The company has during the last two business years not stated their overhead, but simply deducted it from the gross profits. There are obviously large reserves hidden in stock, which doubtless is not valued in paper marks, but in a much more conservative way. The most prominent feature is the comparative lack of liquid means, which are stated to be 25 million marks, which sum contains over 15 million marks of payments on account. Taking into consideration the average rate of exchange of the three business years and comparing it with the assets, quoted above the gradual tightening of the financial situation is manifest.

A slight improvement of the market has become noticeable in the second half of November. This is, however, not so much due to a revival of business as to greater efforts at the sales end. The slackening of incoming business has made many firms stand up and do something. This applies especially to the export business, which is now largely commanding the attention of the manufacturers almost to the exclusion of the domestic market. Concessions in prices on pending specifications have become rather frequent, causing measures to be taken into consideration for stricter handling of export control. It is contemplated to abolish the dis-

crimination, which is up to now being made between countries of destination with a strong and a week currency, the latter frequently acting as intermediaries between Germany and other countries and constituting doubtless a loophole in the export control.

TO STRENGTHEN TRADE METHODS

A stricter control of trade is already demanded. The practice of the certificate of origin, which dealers have to procure for export sales, will not be abolished, as the trade wants, but rather strengthened. In addition, to this, manufacturers intend to reduce the discount of the trade to 10 per cent maximum, in order to prevent cutting of prices from this side. If this new order goes into force, trade will doubtless be checkmated a great deal, but nothing will prevent manufacturers from making arrangements with foreign buyers, by which export prices are underbidden as a matter of fact, if not on the face of it.

The labor situation in the machine building industry has, under the recent silently agreed practice of quick adjustments, arrived at a state of comparative settledness. The unrest among the men, such as prevails, does not originate from this quarter, but from the public outcry for increased production and all the latter would imply to the new rights of the workmen. That the resistance against the abolishment of the 8-hour day will be great, is sure, but it is taken already more or less for granted that it will eventually be overruled by the press of circumstances. In fact, the discussion has now turned away from this point to the question, what should be done first, the stabilization of the mark or the extension of working time. Comparatively little is spoken in regard to reform of the shop council law, the restoration of genuine piece work payment and the other items of a retrograde labor legislation, although they are all included in the attack upon the 8-hour day. With regard to the immediate consequences of this attack, there are hardly any illusions felt. A number of the leading captains of German industry have lately had opportunity to express their opinions at meetings of manufacturers, coinciding in the believe that Germany is, indeed, "on the verge of very grave economical and social developments."

Ford's R.R. Shows Deficit

By the November report, the Detroit, Toledo & Ironton Railroad, owned and operated by Henry Ford, shows a deficit of $138,117 for the month and a net operated deficit of $306,924 for the eleven months ending November 30. Railroad authorities are surprised at this report in the face of the improvement that has been felt by other roads throughout the country. It is pointed out that a year ago this railroad was held up as a model for others to follow and was one of the very few railroads that was showing a profit.

Railroads Show Increase

Class 1 railroads of the country reported a net operating income of $78,660,500 for the month of November, 1922. During the corresponding month in 1921 the net income was reported as $66,884,000. This earning is represented as 4.46 per cent as compared with 3.79 per cent in November, 1921.

Business Items

H. F. T. Erben has been appointed Vice Chairman of the Manufacturing Committee of the General Electric Co. Mr. Erben has been Works Manager of the Schenectady plant for some time. This position will be filled by his assistant, Charles E. Evelett.

The Timken Roller Bearing Service & Sales Co., with branches in all of the principal cities in the United States, has been formulated and will take care of the service and distribution work of the Timken Roller Bearing Co. The new company will be under the direct supervision of the older company.

The Rhode Island Strip Steel Co., Cumberland, R. I., has been incorporated under the laws of Rhode Island, to engage in the manufacture of strip steel, etc. The firm will have a capital stock of $100,000, and the incorporators are Samuel L. Ainscough, George F. Trott, and K. F. Degnan.

The F. B. Shuster Co., wire straightening machinery, etc., New Haven, Conn., has increased its capital stock from $40,000 to $100,000.

The Andrew B. Hendryx Co., brackets, chains, etc., New Haven, Conn., has recently increased the capital stock of the concern from $250,000 to $500,000.

The Belknap Manufacturing Co., plumbing and steam heating supplies, Bridgeport, Conn., announce they have increased their capital stock from $30,000 to $400,000. The firm has recently moved into its new plant on Union Avenue, formerly a part of the Bridgeport Projectile Co.

The Bassett Metal Goods Co., Derby, Conn., has been incorporated under the laws of Connecticut, to manufacture all kinds of metal products. The incorporators of the new concern are all Derby men; F. W. Butehom, Robert A. McLean and H. B. Holland.

The Progressive Manufacturing Co., machine bits, tools, etc., Torrington, Conn., has increased its authorized capital stock from $100,000 to $400,000. A certificate to that effect was filed in the office of the Secretary of State during the week.

The Farrell Foundry & Machine Co., Ansonia, Conn., has recently filed papers with the Secretary of State, increasing its capital stock from $2,700,000 to $3,000,000.

The F. C. Hersee Co., Boston, Mass., has recently been incorporated to engage and deal in all kinds of machinery, tools, etc., with a capital stock of $100,000. At a meeting held during the past week, Frederick C. Hersee was elected president; and David Haviland, of 99 Cambridge St., Winchester, Mass., was chosen treasurer.

The Pawtucket Manufacturing Co., manufacturers of bolts, etc., Pawtucket, R. I., has increased its capital stock from $100,000 to $500,000.

The P. Pryibil Machine Co., New York, has purchased its property consisting of two five story buildings at 512 to 528 West Forty First Street between Tenth and Eleventh Avenues.

Bingham & Co., New York, is the new company that has been formed to continue the banking, Calcutta, strawbraid, general import and export departments of Smith & Schipper. Charles T. Bingham and Charles E. Bingham, who were members of the Smith & Schipper firm are the founders of the new company. Smith & Schipper will continue with offices at 91 Wall St. Bingham & Co. will also be located at that address.

The William E. Quinn Co., Northampton, Mass., saw manufacturer, has announced a reorganization plan by which the concern will engage in the distribution of sawmill machinery along with enlarged manufacturing operations. William E. Quinn continues to head the concern and associated with him are William M. Cordes, manager and treasurer of the Florence Manufacturing Co., D. W. Long lumber manufacturer, Shelburne, Mass., and Albert G. Beckmann, Northampton. The company is capitalized at $50,000, all capital stock.

The Smith & Wesson firearms manufactory, Springfield, Mass., has been reorganized under the name of Smith & Wesson, Inc., with a capitalization of $2,500,000. It is stated that the change has been made for legal reasons and no change will take place in the operation of the plant.

Rennold Equipment Co., Lumber Exchange Building, Chicago, Ill. has moved its offices to the Standard Trust Building, Chicago, Ill.

Barbour, Love & Woodward, Inc., New York City, announce the removal of the offices from 45 West 18th St. to the Grand Central Terminal Building.

The Goss & DeLeeuw Machine Co., of New Britain, Conn., recently incorporated, has opened its plant at 48 Grove Hill, New Britain, and has started operations. At a meeting held the past week the following officers were elected: S. T. Goss, New Britain, president and treasurer; A. L. DeLeeuw, Plainfield, vice-president; J. S. Black, New Britain, secretary.

The Mattatuck Manufacturing Co., screw machine products, Waterbury, Conn., has recently increased its capital stock from $525,000 to $750,000.

The Erie Malleable Iron Co., Erie, Pa., has taken out a group insurance policy with the Travelers Insurance Co., insuring their 1,500 employees with an insurance policy of $1,000 each.

The Chase Companies, Inc., Waterbury, Conn., brass and wire rolling mills, etc., have increased the capital stock of the company from $5,000,000 to $10,000,000.

The Connecticut Foundry Co., Rockhill, Conn., has increased its capital stock $100,000 making its authorized capital stock $200,000.

Questionnaires Sent to Eastern Roads

New questionnaires asking for specific information regarding their equipment have been received by the railroads in the eastern district from the Interstate Commerce Commission. Nearly all of the railroads report that they have the information desired.

The number of freight cars owned or leased, the estimated number of additional cars needed, the age of the cars now in service, locomotives owned or leased, those serviceable and those unserviceable, number of locomotives needed, freight cars used daily, freight car shortage and surplusage, are among the questions asked.

British Machinery Market Improves

Battleship contracts to ultimately aid tool business—India proves good market—Steam locomotives and Railway supplies moving—Labor difficulties still a problem

BY OUR LONDON CORRESPONDENT

CONDITIONS in the metal industries have, of late, taken a better turn and this is mainly due to the numerous—though almost unexpected—orders for cargo vessels that have been placed in practically all the shipbuilding centres, coupled, no doubt, with the fact that at last the question of ordering the two battle cruisers has been definitely settled, plus the anticipation of orders from the railways. The last will follow the completion of amalgamations, the negotiations towards which have been accelerated. As to cargo vessels, it is, of course, known that a number are laid by, but the explanation is offered that these are not always of the right kind and orders are being placed from day to day at prices which, all things considered, compare with those of the pre-war period—at least for shipbuilding. In certain instances, the cost of propelling machinery has proved a handicap and quotations have not been accepted. Without going into details, the building of the new battleships will undoubtedly ease the unemployed problem on the northeast coast of England, in Manchester, Sheffield and even in Woolwich. If on the ground of cost, the Clyde district has been disappointed (for it was anticipated that at least one of the vessels would be allocated to that area) yet a considerable portion of the armour and armament needed will be produced there. The work will be spead over three years and, although the total cost is not known, the lowest estimate as to wages paid in that period is ten million pounds. In all, approximately 500 firms will participate.

Of course, it is too early yet for any special activity in the machine tool shops as the result of shipbuilding contracts, but the railways have been ordering to some slight extent, and India has again proved a good friend, while in some few instances the automobile firms have added to their plants. A small revival may be mentioned, for example, in orders for gear-cutting machinery. One of our firms will again essay the task of supplying the American market with certain special machine tools.

While shipbuilding has until quite recently languished, ship repair work on the other hand has not been unsatfactory to the firms concerned. This is pointed out in the report of Thorneycroft & Co., which, however, indicates a slight falling off in profits; these amounted to £52,341 as compared with £56,775 the year previous, the latter itself being a great reduction. This decline is ascribed to the present depression in the shipbuilding and motor industries, and members of this firm in particular have for some time been urging in the press the need for a protective tariff on imported commercial vehicles.

Steam locomotive orders have been received from India and elsewhere of late, and one or two Scottish firms are in a better position. Vickers, Ltd., have been successful in obtaining contracts for the electrification of railways in South Africa and also for the supply of electric locomotives there. This section of the firm's electric work is to be done in Sheffield.

The limitations of the aeroplane for the transport of passengers and goods have been made evident on several occasions of late when the weather prevented flying over the Channel and the only aeroplane service operating was that between Manchester and London. On one occasion the flying conditions were reversed. As to the service between London and Paris, it is asserted that even during the busiest part of the year more than 60 per cent of the passengers have been foreigners and that of the total number of passengers, more than three-quarters were merely on pleasure bent.

> "The railways have been ordering machine tools to some extent and India has again proved a good friend, while in some few instances, the automobile firms have added to their plants. A small revival may be mentioned, for example in gear cutting machinery. One of our firms will again essay the task of supplying the American market with certain special machine tools."

Meanwhile the stocks held by the government are not likely to form the bugbear in the future they have sometimes appeared to be in the past, for it has been officially stated that the estimated value of all such surplus, including land, buildings and factories unsold and in the hands of the Disposal Board is about 20 million pounds.

Wholesale prices have shown a slight increase of late but have by no means caught up to the retail prices, and the marked difference between the two has led to the inauguration of a government inquiry into the profits that accrue between the farmer here and the ultimate consumer. Farm wages and, in fact, farming prospects generally must be described as unsatisfactory. A committee of the Mines Department has been considering the same problem as applied to the price of coal. The disparity between pit head prices and the final selling prices has led to bitter complaints on the part of the miner, whose wages, if still above pre-war, have in many instances fallen well below cost of living estimates. The increase in price is probably largely due to the government control during the war, when every step between the producer and ultimate consumer was allowed to show a definite profit instead of an overall profit being taken.

The cost of living figures indicate once more a rise of 80 per cent on pre-war, and the numbers of the unemployed, which will exceed one and one-third million, have fluctuated slightly, showing for four weeks an increase and then a decrease. The changes are mainly seasonal and, apart from any particular improvement in general trading, the numbers are confidently expected to diminish as the new year opens out. The Amalgamated Engineering Union, which about a month ago reported a slight improvement in employment, has during the year been steadily losing membership, the decline being more than 51,000 up to the beginning of December, when the membership did not quite reach 358,000. Even then, for the unions amalgamated, it was about 100,000 higher than the pre-war figures. In view, however, of the recent loss of membership, some reconstruction is mooted.

Fire Damages Mark Mfg. Co. Zanesville Plant

The Zanesville plant of the Mark Manufacturing Co., was badly damaged by fire on the morning of December 23 to an extent of $400,000. An explosion under an enameling tank started the blaze. A series of explosions followed. The concern has its general offices at Chicago, Ill. The local offices are situated in Cleveland St., with Perry C. Mark as superintendent. The company manufactures standard steel pipe, standard tubing, line pipe, drive pipe, oil well casing and boiler tubes and wrought iron pipes.

Large Locomotive Order

During the last two weeks of 1922, orders to the amount of $6,600,000 were received by the American Locomotive Co., the largest total for any like period during the past two years. The orders were from various railroads in the United States and abroad and called for the delivery of 133 engines. Total orders on its books at the close of the year were valued at approximately $45,000,000.

Clarke New Secretary of Iron and Steel Institute

The following announcement has been made by E. H. Gary, president of the American Iron & Steel Institute:

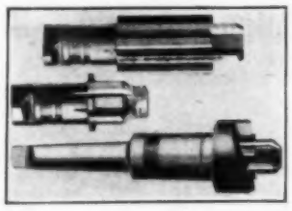
"E. A. S. Clarke, one of the directors of the American Iron and Steel Institute, lately in charge as president of the Consolidated Steel Corporation, now in liquidation, and formerly president of the Lackawanna Steel Co., has been duly elected secretary of the institute."

Mr. Clarke will assume his new duties Feb. 1 and until that time will continue as president of the Consolidated Steel Corporation.

Condensed-Clipping Index of Equipment

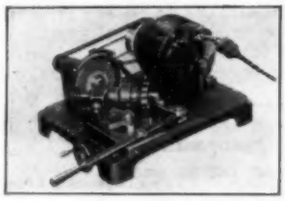
Patented Aug. 20, 1918

Counterbore Cutting Tool, Multi-Diameter, Interchangeable
Eclipse Interchangeable Counterbore Co., Detroit, Mich.
"American Machinist," November 23, 1922



The tool has separate blades to cut each diameter and is intended for use with the regular interchangeable counterbore to replace the tools having all diameters on one set of flutes. It is of use on automotive engines, especially for machining core holes and spark plug holes. The tool has been made for finishing as many as six diameters by means of one cutter. The small diameter blades extend the full length of the tool and are placed between the blades that cut the large diameter. It is possible in sharpening to grind both diameters all the way from the forward end to the rear, as in the middle view. The life is equal to that of the full length of the blades that cut the largest diameter.

Grinding Machine, Valve, Portable, Model C
Franklin Machine & Tool Co., Springfield, Mass.
"American Machinist," November 23, 1922



The machine is for grinding automotive poppet valves to a fixed angularity, and for grinding reseating cutters adapted for cutting valve seats to the same angularity as that of the valve. The machine can be assembled for grinding valves to any desired angle, but is not adaptable for adjustment from the angle to which it was originally set at the factory. The motor is mounted on a low, flat base away from the grinding wheel, the cross slide, and the valve rotating members. A hand lever serves for reciprocating the slide carrying the work so as to move the valve across the face of the wheel. A handwheel provides the feed toward the wheel.

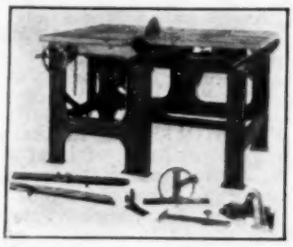
Vise Stand, Pipe, Portable
American Pipe Tool Co., 123 So. Jefferson St., Chicago, Ill.
"American Machinist," November 23, 1922

The stand is for the use of plumbers, steam-fitters, electricians and pipe-fitters for supporting a pipe vise. It is made of malleable iron, and provided with a shelf for holding tools. The pipe bender is a part of the body casting, and the legs are easily attachable. The legs are provided with holding points and feet to prevent slipping. The stand can be drilled for holding any type of hinged or chain pipe vise having a capacity up to 2½ in. Weight with vise, 50 pounds.

Press, Power, Screw, No. 63
Atlas Press Co., Kalamazoo, Mich.
"American Machinist," November 23, 1922

The press is intended for pressures up to 50 tons. For work from 25 to 50 tons, the ram speed is about 7 ft. per minute. The drive of the press is operated through a marine type of clutch controlled by means of an adadjustable hand lever on the right-hand housing. The screw has a 2-in. lead, double Acme thread, but can be furnished with a single thread, so the clutch can be released and the pressure held without consuming power. Special bases and fixtures can be supplied, as well as an hydraulic pressure gage. A motor base for a 5-hp. motor can be secured to the rear. Capacity, 37½ in. wide, 32 in. high. Maximum ram movement, 24 in. Floor space, 27 x 48½ in. Height, 76 in. Weight, 2,900 pounds.

Saw Bench, Bevel and Miter, Universal
Hooker Manufacturing Corporation, St. Johnsbury, Vt.
"American Machinist," November 23, 1922

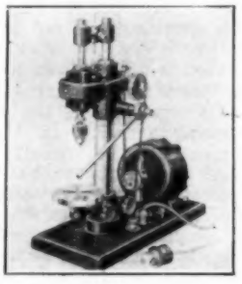


The saw bench is equipped with a tilting arbor and sliding table. The saw can be raised or lowered by handwheel, adapting it for grooving or rabbeting. The handwheel on the front tilts the saw to any angle up to 45 deg. The left-hand table is movable sidewise, is adjustable to the saw, and is supported by hinges at the back. The right-hand table running on rolls carries the work to the saw and has a sidewise adjustment so that a dado head can be employed. The yoke carrying the saw can be raised or lowered by a handwheel on the front of the machine. Saws from 6 to 18 in. in diameter can be used, the latter cutting stock up to 6½ in. thick. For motor drive, a 3-hp. motor is supported by brackets on the rear of the frame. Floor space, 72 x 58 in. Weight, 1,250 and 1,550 pounds.

Grinder, Cutter, No. 1
Oakley Machine Tool Co., Middletown, Ohio.
"American Machinist," November 23, 1922

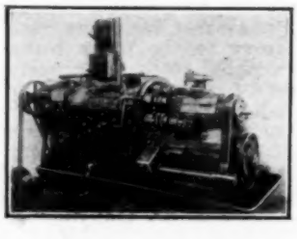
The cutter grinder is especially fitted for work in small plants having only one or two milling machines and a small toolroom. The table, supported in the middle and at both ends, has a taper adjustment graduated in inches and degrees. The wheel head may be swivelled on the column 180 deg. in either direction. The wheel spindle, driven by belt, carries two wheels. A fast or slow table movement can be obtained by means of a slip gear. The machine can be manipulated from either side. A universal vise and various other attachments are furnished. Movements: Longitudinal, 12 in.; cross, 5¾ in.; vertical, 9 in. Capacity, 15 in. Swing over table, 8 in. Distance table to spindle, 8¾ in.

Drilling Machine, Portable
Adolph Muehlmatt, 5th and Elm Sts., Cincinnati, Ohio.
"American Machinist," November 23, 1922



The machine is suitable for precision tool and manufacturing work. The machine and motor are entirely separate, so that drive from overhead or another motor may be substituted. The base rests on three rubber contacts. The spindle has a $\frac{5}{16}$-in. diameter and a vertical travel of 2 in. controlled by adjustable stops. The idler pulley bracket is adjustable. The table is adjustable radially as well as vertically. There is a 4-in. space between table and chuck, and 8 in. between base and chuck. The chuck takes any size of drill up to ½ in. The feed is of the ratchet-lever type. Jigs may be fitted in place of the table. The spindle speed is from 1,500 to 2,500 r.p.m., but any speed up to 8,000 r.p.m. may be furnished.

Chucking Machine, Six-Spindle, Horizontal
Baird Machine Co., Bridgeport, Conn.
"American Machinist," November 9, 1922



The machine is virtually an automatic lathe for handling five short pieces of work at one time, such as small castings, forgings and bar stock requiring a number of operations that can be performed on a lathe. As many as twenty-one cutting tools can be used simultaneously. Separate toolslides are supplied for each working position, with two lengths of feed. Eight changes of speed by quick-change gears are provided in the main drive and three in the drive for each spindle, so that twenty-four speeds are available for each spindle. The cutting tools have seventeen changes of feed. Capacity, work up to 6 x 6 in. Spindle speed, from 28½ to 440 r.p.m. Floor space, 93 x 46 in. Weight, 8,500 pounds.

[Note: To supersede the card published on page 980f, Vol. 57 of *American Machinist*.]

Clip, paste on 3 x 5-in. cards and file as desired

Personals

RALPH L. GLASER, who for several years has been the Connecticut sales representative of the Warner & Swasey Co., Cleveland, has been appointed New England District Manager with headquarters in the Oliver Building, Boston. Mr. Glaser succeeds H. L. Kinsley who recently died.

ARTHUR H. KEETCH, Buffalo sales representative for Warner & Swasey Co., Cleveland, has been appointed district sales manager for the Buffalo and Pittsburgh districts with headquarters in the Iroquois Building, Buffalo.

J. E. YORKSTON has been promoted from the position of engineer in charge of the drafting department of the General Electric Co., to consulting mechanical engineer. Mr. Yorkston will assist the designing engineers of the company in connection with important mechanical problems and will also serve as a consulting authority in all matters pertaining to drafting practice.

R. R. GORE, former manager of the supply department of the Fairbanks Co., Baltimore, Md., has organized the Sales & Engineering Co., 14 S. Broadway, Baltimore, and will act as local Baltimore and Washington agent for the New Process Twist Drill Co., Tauton, Mass., and other lines.

JULES N. WINSTEN, formerly of the Bancroft Corp., Worcester, Mass., will represent the Consolidated Tool Works, Inc., New York, in Illinois, Wisconsin, Minnesota, Indiana, Iowa, Missouri, Nebraska, Kansas, Michigan, North and South Dakota, Ohio and also in Louisville, Ky.

JOSEPH R. SHEPPARD, for a number of years hydraulic engineer in charge of the Hydraulic Machinery Department of R. D. Wood & Co., and acting as Consulting Engineer for the Espen-Lucas Machine Works for the past two years, has again resumed full charge of engineering department of R. D. Wood & Co., on hydraulic machinery.

A. H. D. ALTREE, vice-president of the American Bosch Magneto Corp., Springfield, Mass., is leaving for a trip to England and Continental Europe for the purpose of furthering the company's foreign sales.

Obituary

JAMES J. DOYLE, one of the owners of the Doyle-Wall Machine and Tool Co., Syracuse, died at his home Jan. 1. He was 58 years old. Mr. Doyle had always been associated with the machine tool industry. He organized the Llewellyn & Doyle Machine and Tool company and had been active in other firms.

JAMES L. WHEELER, an employee of the Babcock Printing Press Manufacturing Co., New London, Conn., and a machinist for more than 30 years, died suddenly December 29 of heart disease. Mr. Wheeler was well known in New London and was a member of the Bayview Lodge, A. F. & A. M. and had held many offices in the N.E.O.P. grand lodge. He is survived by his wife, and two daughters.

WILLIAM B. WALKER, president of the American Thermos Bottle Co., Norwich, Conn., died at his home in New London, Conn., Dec. 29, after a five weeks' illness with heart disease. Mr. Walker was born in Racine, Wis., 55 years ago.

SAMUEL RAYNOR died December 26 in Providence, R. I. Mr. Raynor was assistant treasurer of the Builders Iron Foundry and the Diamond Machine Co., and had been with these concerns in executive capacities for the past twenty years.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Machinery for handling rice. Colombia. Catalogues and price lists are desired. Reference No. 4877.

Malleable fittings. Norway. Agency desired from manufacturers. Reference No. 4898.

Electrical supplies, electrical machinery and automobile supplies. Mexico. Agency desired. Terms: cash. Reference No. 4909.

Electrical machinery, textiles, general merchandise, construction materials and railway supplies. Chile. Agency desired. Reference No. 4910.

Agricultural machinery and implements. Sweden. Purchase desired. Quotations, c.i.f. Swedish port. Terms: cash against documents. Reference No. 4845.

Ice manufacturing plant, of a capacity of about 10 tons daily. Venezuela. Purchase desired. Information is requested on both ammonia and ethyl chloride plants. Quotations, f.o.b. New York or New Orleans. Correspondence, Spanish. Reference No. 4846.

Brass brazing apparatus, machinery for cutting sheets, and rivet making machines. India. Purchase desired. Quotations, c.i.f. Indian port. Cash against document. Reference No. 4848.

Machinery of the lighter and cheaper types for the manufacture of shoes, paper boxes, coffee cleaning, rice cleaning and tin can making. Panama. Agency desired. Quotations, f.o.b. New York. Payment; cash. Reference No. 4859.

Trade Catalogs

Lathes and Attachments. The Sebastian Lathe Co., Cincinnati, Ohio. Fifteen inch and 18 inch lathes for many purposes are shown in catalogue 27 recently issued by this company. Swing cone head, swing geared head, apron controls, and other models are illustrated with full page silhouetted illustrations and are described with an equal amount of text. The catalogue is well made up with 28 pages and an attractive light blue cover.

Geared Head Lathes. The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. The 25 and 27 inch geared head engine lathes, known as the LeBlond Heavy Duty Single Pulley Drive, are shown in the November catalogue recently received by the trade. Each part of the lathe has been carefully explained and separately illustrated, while the center piece of the catalogue contains a large illustration of the assembled lathe and each part clearly brought out and lettered. A page of specifications are also to be found. The catalogue is most complete and worthy of perusal.

Single Stage Steam Turbine. De Laval Steam Turbine Co., Trenton, N. J. "Plants and Products" is the title of the latest catalogue, designated as catalogue P, that has been issued by this company. Illustrations of installations, silhouetted illustrations of various turbines and axial sections of velocity and pressure stage turbines are shown. A rather comprehensive description of the DeLaval plant and the products which are manufactured by the company are also included in the catalogue. It is printed on a special coated stock with a heavy vellum cover.

Stokers, Fuel Systems, Oil Burners, Coal Dryers, Ash Conveyors, Waterbacks, Fuel Retarders, Oil Torches. The International Combustion Engineering Corporation, 43, 45 and 47 Broad St., New York City. Many varieties of stokers and other products named above are fully described and well illustrated in the first catalogue to be published by this corporation. Designs, cross section drawings, and other forms of illustration are used.

Buys Six Frog Planers

Six additional frog and switch planers made by the Liberty Machine Tool Co. have been purchased by the Ramapo-Ajax Corp., Hillburn, N. Y., through McCabe & Sheeran Machine Corp., New York. Two similar planers were purchased last summer on a trial order, the larger order at this time being the result.

Forthcoming Meetings

American Engineering Council, Annual Meeting, January 11 and 12, at the headquarters of F. A. E. S., 24 Jackson Place, Washington, D. C. L. W. Wallace, Secretary.

National Automobile Chamber of Commerce, National Automobile Show, January 27 to February 3, 1923, Coliseum and First Regiment Armory, Chicago, Ill.

Society of Automotive Engineers, annual meeting, Jan. 9 to 12, 1923, Engineering Societies Building, 29 West 39th St., New York City. C. F. Scott is chairman.

American Institute of Electrical Engineers, Mid-Winter Meeting, February 14 to 16. Engineering Societies Bldg., New York. F. L. Hutchinson, Secretary.

American Society for Steel Treating, Winter Sectional Meeting, City Club, Chicago, Ill., Feb. 15 and 16, 1923. National Secretary, W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio.

Universal Patent Exposition, First Annual Convention and exhibit of patents and inventions, Grand Central Palace, New York City, February 17 to 22, 1923. A. B. Cole, 110 West 40th St., New York City, is chairman.

American Institute of Mining and Metallurgical Engineers, Annual Meeting, February 19 to 21. Engineering Societies' Bldg., New York. F. S. Shartless, Secretary.

Society of Industrial Engineers, Spring convention at Hotel Gibson, Cincinnati, Ohio, April 18 to 20. Secretary, George C. Dent, 327 South La Salle St., Chicago, Ill.

American Foundrymen's Association. Annual convention, and exhibition at Public Hall, Cleveland, Ohio, April 30 to May 3, 1923. C. E. Hoyt, 140 South Dearborn St., Chicago, is secretary.

American Electro Chemical Society, Semi-annual meeting, Hotel Commodore, New York City, May 3 to 5, 1923. Colin G. Fink, 327 South La Salle St., Chicago, Ill., is secretary.

National Supply and Machinery Dealers' Association; Southern Supply and Machinery Dealers' Association; and the American Supply and Machinery Manufacturers' Association, triple convention, in Cincinnati, Ohio, May 17, 18, 19, 1923. F. D. Mitchell, 1819 Broadway, New York City, is secretary.

American Society for Testing Materials. Annual meeting at Atlantic City, June, 1923. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Pig-iron and scrap prices higher; with steady advance in coke. No. 2 foundry iron up $2 and basic, $1.75 per ton at Pittsburgh. Steel prices tending upward. That big tonnage buyers expect the market to go no lower is indicated by desire to purchase for first half requirements. Bars, shapes and plates, firm at $2 per 100 lb., Pittsburgh. No price shading in bars; mills sold up for first quarter delivery. Tendency to shade quotations on shapes and plates, disappeared from market. Mills filled upon structural orders; deferred deliveries on new business. Electric welding wire up ½c. per lb. in New York warehouses.

Lead and zinc markets stronger; electrolytic copper stable. Lead, 7⅜c. as against 7⅝c. per lb., last week, in New York warehouses. Aluminum ingots advanced 1c. per lb. in Cleveland. Solder up ½c. in New York and 1½c. in Cleveland, during week. Dealers' purchasing prices of old metals, nonferrous, also ½c.@¾c. per lb. higher in Cleveland. Both New York and Cleveland report higher quotations on cotton waste.

Declines—Antimony down ½c. and copper sheets. ½c.@¾c. per lb. in Cleveland warehouses, since last week. Sal-soda and roll sulphur, declined in New York market. Raw linseed oil, 90c. in New York as against 93c. per gal. (5 bbl. lots); market weak with tendency to shade prices.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$27.55
Northern Basic	28.27
Southern Ohio No. 2	29.77
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	33.44
BIRMINGHAM	
No. 2 Foundry	23.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	29.76
Virginia No. 2	33.17
Basic	26.75
Grey Forge	27.75
CHICAGO	
No. 2 Foundry local	28.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	29.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	27.00
Basic	26.00
Bessemer	27.50

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.0
Cleveland	5¼@6
Cincinnati	4.5@6
New York	5.5
Chicago	4@5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.50	4.19	3.70	4.00
No. 12	2.60	4.24	3.75	4.05
No. 14	2.70	4.29	3.80	4.10
No. 16	2.90	4.39	3.90	4.20
Black				
Nos. 17 and 21.	3.20	4.30	4.20	4.70
Nos. 22 and 24.	3.25	4.35	4.25	4.70
Nos. 25 and 26.	3.30	4.40	4.30	4.75
No. 28	3.35	4.50	4.40	4.85

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	3.35	4.50	4.40	4.85
Nos. 12 and 14.	3.45	4.60	4.50	4.95
Nos. 17 and 21.	3.75	4.90	4.80	....
Nos. 22 and 24.	3.90	5.05	4.95	5.40
No. 26	4.05	5.20	5.10	5.55
No. 28	4.35	5.50	5.40	5.90

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	66	54½	⅜ to 1¼	34	19
LAP WELD					
2	59	47½	2	29	15
2½ to 6	63	51½	2½ to 4	32½	19
7 to 8	60	47½	4½ to 6	32½	19
9 to 12	59	46½	7 to 12	30	17
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1¼	64	53½	⅜ to 1¼	34	20
2 to 3	65	54½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	57	46½	2	30	17
2½ to 4	61	50½	2½ to 4	33	21
4½ to 6	60	49½	4½ to 6	32	20
7 to 8	56	43½	7 to 8	25	13
9 to 12	50	37½	9 to 12	20	8

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	57%	44%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded	54%	41%	53½%	40½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 6%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.39	3.71	3.90
Cold rolled strip steel	6.75	8.25	7.25
Floor plates	5.50	5.16	5.50
Cold finished shafting or screw	3.90	3.75	3.70
Cold finished flats, squares	4.40	4.25	4.20
Structural shapes (base)	3.14	3.01	3.02½
Soft steel bars (base)	3.04	2.91	2.92½
Soft steel bar shapes (base)	3.04	2.91	2.92½
Soft steel bands (base)	3.84	3.61	3.55
Tank plates (base)	3.14	3.01	3.02½
Bar iron (2.60 at mill)	3.04	2.91	2.92½
Drill rod (from list)	55@60%	40%	50%
Electric welding wire:			
⅝	8.50		12@13
¼	7.00		11@12
5/32 to ½	6.75		10@11

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York	15.37½		
Tin, 5-ton lots, New York	39.25		
Lead (up to carlots), St. Louis 7.20; New York, 7.75.			
Zinc (up to carlots), St. Louis 7.05@7.10; New York, 7.50			
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	24.00	23.00
Antimony (Chinese), ton spot	7.25	8.25	7.25
Copper sheets, base	23.50	22.00	23.00
Copper wire (carlots)	16.62½	18.75	16.25
Copper bars (ton lots)	20.50	22.75	19.50
Copper tubing (100-lb. lots)	25.25	25.75	23.00
Brass sheets (100-lb. lots)	19.00	21.25	18.75
Brass tubing (100-lb. lots)	23.50	24.25	20.50

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (1,000-lb. lots)	17.00	19.50	15.75
Brass wire (carlots)	19.50	20.75	.....
Zinc sheets (casks)	10.25	10.25	.....
Solder (½ and ½), (caselots)	28.00	26.25	20.00
Babbitt metal (83% tin)	42.00	49.00	36.00
Babbitt metal (35% tin)	25.00	17.50	.....
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.50	12.75	12.25
Copper, heavy, and wire	12.25	12.00	11.75
Copper, light, and bottoms	10.50	10.50	11.00
Lead, heavy	5.75	5.50	6.00
Lead, tea	5.25	4.50	4.75
Brass, heavy, yellow	7.00	....	....
Brass, heavy, red	9.50	10.00	9.50
Brass, light	6.00	6.00	6.50
No. 1 yellow brass turnings	7.00	7.00	7.50
Zinc	4.50	4.00	4.25

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.00	11.50	14.50
IC,	112 sheets	12.30	11.90	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.00	7.25
IC,	14x20	7.25	6.25	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.11½	$0.13	$0.11½
Cotton waste, colored, per lb.	.08½	.10	.08
Wiping cloths, 13½x13½, per lb.	.16	32.00 per M	.10
Wiping cloths, 13½x20½, per lb.	.20	48.00 per M	.13
Sal soda, 100 lb. lots	2.60	2.40	2.65
Roll sulphur, per 100 lb	2.35	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.90	1.01	.98
White lead, dry or in oil	100 lb. kegs.	New York, 13.50	
Red lead, dry	100 lb. kegs.	New York, 13.50	
Red lead, in oil	100 lb. kegs.	New York, 15.00	
Fire clay, per 100 lb. bag		.65	
Coke, prompt furnace, Connellsville	per net ton	$8.50@9.00	
Coke, prompt foundry, Connellsville	per net ton	8.50@9.00	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40%	50-10-5%	50%
1½ and 1¼x3 in. up to 12 in.	20%	50%	50%
With cold punched sq. nuts	25%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	15%	3.90 net	.....
Hex. head and hex. nut bolts	20%	.....	65-5%
Lag screws, coach screws	40%	.....	60-5%
Square and hex. head cap screws	70%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30%	40-10%	45%
Bolt ends, with hot pressed nuts	40%	.....	55%
Tap bolts, hex. head, list plus	20%	.....	.....
Semi-finished nuts ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.00	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	4.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.00	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	45%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$5.00	$3.90	$3.75
Cone heads, ditto (net)	5.10	4.00	3.85
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
¾ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	55-5%	50%	50%
Copper burs	35%	50%	20%

Lard cutting oil (50 gal. bbl.) per gal.	$0.50	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin. ft., $2.88:			
Medium grade	30-10%	40½%	50%
Heavy grade	20-5-2½%	30-5%	40-5%
Rubber and duck:			
First grade	60%	50-10%	40-10%
Second grade	65%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.24	1.40
Cloth	3.02	2.67	3.20

New and Enlarged Shops

Machine Tools Wanted

Fla., Miami Beach—Sun Oil Co.—machine shop equipment.

Ind., Connersville — Connersville Brass Fdry., Pratt Alley, E. Moran, proprietor—drill press and lathe (used preferred).

Ind., Connersville—Ready & Conley, 119 Pratt Alley, (machine shop)—milling machine; power equipment.

Ind., Rushville—Bussard Garage, 2nd and Perkins Sts., O., Bussard, Purch. Agt.—power lathe and other machinery (used).

N. Y., Brooklyn—Brass Goods Mfg. Co., 345 Eldert St.—No. 3 double acting crank press (used).

N. Y., Buffalo—Bd. Educ., 1401 Telephone Bldg.—receiving bids until Jan. 18, machine shop, woodworking, sheet metal and electrical equipment.

N. Y., Buffalo—A. J. Eberl, 103 Sycamore St.—machinery and equipment for automobile repair shop and garage.

N. Y., Buffalo—A. Yavno, 111 Grey St.—equipment for garage and repair shop at 1787 Genesee St.

N. Y., Jamestown—Jamestown Iron Wks. Co., Sherman Pl.—machine shop and foundry equipment, to replace that which was destroyed by fire.

N. Y., Lyons Falls—Gould Paper Co., H. P. Gould, Purch. Agt.—roll grinding lathe.

N. Y., New York—H. Medalie, 908 Stebbins Ave., (machinist)—3 lathes, 2 shapers and 4 milling machines.

N. Y., North Tonawanda—Dodge Bros. Motor Co., Main St.—service station and repair department machinery, tools and equipment, to replace that which was destroyed by fire.

N. Y., Norwich—A. G. Jones—dies, jacks and complete garage and repair shop equipment.

N. Y., Sacket Harbor—W. H. Weaver Co., (machine shop)—sheet and rod bending equipment, electrically driven.

N. C., Charlotte—Smith Novotoy Electric, Inc., 4 South Church St., (electric goods)—machine tools for model making shop, including 6 in. portable jointer; small lathe with good-sized hole through spindle for chucking up to ¾ in. brass rods, motor driven or direct belted from motor; light duty saw table, high speed, table of sufficient width to saw thin panels 12 to 20 in. wide and saw true smooth edges.

N. C., Raleigh—Raleigh Iron Wks., West Hargett St., (iron, machinery, etc.)—Universal armor plate type punch and shear to handle shear beams up to 10 in., channels up to 9 in., angles up to 6 in., round bars up to 2¼ in., square bars up to 2¼ in., that will punch beams in both flanges and webb up to 18 in., approximately 24 in. throat, motor drive preferred (new or used).

O., Columbus—Columbus Socker Rod Co., 525 West 1st Ave., J. W. Shaw, Purch. Agt.—one forging machine and one 16 in. turret lathe.

O., Columbus—Duplex Piston & Grinding Co., 272 North 3rd St., R. D. Harnish, Purch. Agt.—two automatic milling machines, one drill press and other equipment.

O., Columbus—Lyman Motor Co., 671 North 4th St., A. F. Lyman, Pres.—general equipment for automobile service station, including drill press and probably small lathe.

O., Youngstown — Wick Ave. Motor Co., Wick Ave., J. Hay, Mgr.—automobile service and repair station equipment for shop at Sharon, Pa.

Pa., Corry—A. R. Rodgers Co., (fabricated steel)—plate, shear for ½ x 48 in. plate.

Pa., Galeton—Galeton Garage Co.—equipment to replace that which was destroyed by fire.

Pa., Johnstown—City Comrs.—receiving bids until about Feb. 22, equipment, including lathes and tools, for machine shop on Market and Stoneycreek Sts.

Pa., Phila.—S. G. Flagg Co., Inc., 1421 Chestnut St., (Steel and iron fabricators)—additional punches, hammers heaters, shears, etc. for new plant at Stowe.

Pa., Pittsburgh — Pennsylvania R.R., Pennsylvania Sta., W. G. Phelps, Purch. Agt.—vertical press for Dennison, O.

Pa., Scranton—Collin Supply & Mchy. Co., Brooks Bldg.—wire straightening and cutting machine to handle wire .059 in. and smaller.

Tenn., Knoxville — Knoxville Iron Co., Lonsdale St.—one 24 in. roll lathe.

Va., Ashland—G. C. Skillman, (general repair work)—small tools.

Va., Doswell—S. James (automobile repair work)—small tools.

Va., Richmond—Hackley Morrison Co., Inc., 1708-22 Lewis St., (machinery)—14 in. x 12 ft. lathe; 26 in. x 14 ft. quick change lathe; 24 in. x 14 ft. quick change lathe; 84 in. and 60 in. boring mills; plain turning lathe, 34 in. x 14 ft. bed; 20 in. upright drill; four-sided planer and matcher; rip saw; trimmer; carload of 6 in. diam. pipe, wrought iron or steel; 3 miles of 35 lb. relay rails for North Carolina delivery; 10 hot water radiators; 3 ore screens; 10,000 to 12,000 gal. fuel oil tank; belt conveyor, 12 ft. between centers, belt 12 in.; portable conveyor, 20 ft. centers; stiff leg derrick, 50 ft. boom, 2 ton capacity with bull wheel; 25 hp. D.D., D.C. hoisting engine, (used); 50 hp. Fairbanks, Morse type Y oil engine; A.C. electric hoist, 220 or 440 volt, double drum with boom swinger; two 10 ton, 36 in. gauge locomotives.

Va., Richmond—C. F. Sauer Co. (manufacturer of extracts), Meadow and Broad Sts.—machine shop equipment for glass works.

W. Va., Huntington—Moore & Eaton—machine shop equipment.

Wis., Green Bay—Riverside Steel & Structural Co., H. L. Flower, Mgr.—machinery and equipment for machine shop to fabricate shapes and plates.

Wis., Kenosha—Simmons Mfg. Co., foot of Pearl St., Z. G. Simmons, Pres.—machinery and tools for the manufacture of steel furniture.

Wis., Milwaukee—Pyro Co., 3220 Vliet St., (manufacturer of gas heaters)—drill press, lathe and motors.

Machinery Wanted

Ala., Selma—Bd. Educ.—vocational equipment for $100,000 school, here.

Ala., Tarrant—Natl. Cast Iron Pipe Co.—additional foundry equipment.

Calif., Orange—C. E. Short—refrigeration machinery and equipment.

Conn., East Portchester (Portchester, N. Y. P. O.)—E. Senft, 223 Mill St., (millwork)—bore machine, triple-drum sander, swing cutoff saw, grinding wheel, small sash sticking machine and double spindle shaper.

Conn., Hartford—High School Plant & Building Comn., W. H. Scoville, Chn.—$25,000 worth of machinery and tools for vocational department of new Thomas Snell Weaver High School.

Conn., Wallingford — Wallingford Steel Co.—8" in. cold rolling mill, motor driven (used).

Conn., Waterford—Jordan Mill—machinery for addition to woolen mills.

D. C., Wash.—A. L. Flint, Genl. Purch. Officer of the Panama Canal, Wash., D. C.—receiving bids until Jan. 19, for pumps, return track turnouts, steel chain, corrugated roofing, iron or steel rope and cable, seizing wire, iron or steel pipe, brass and copper tubing, screws, nails, machetes, scythe blades and snaths, grommets and electrical wire.

Ga., Hawkinsville—J. E. and O. R. Jelks—tile making machinery.

Ga., Rome—Battery Mchy. Co., West 2nd Ave.—air compressor, 2,000 ft. capacity.

Ga., Thomaston—Peerless Cotton Mills, (manufacturer of bed sheets)—additional machinery and equipment for mill.

Ill., Chicago—Dering Coal Co., 332 South Michigan Ave.—equipment for proposed coal washer at Clinton, Ind.

Ind., Connersville—J. A. Higgs, 106½ West 6th St.—power job press with Mitler feeder (used preferred).

Ind., Montpelier—The Herald—8 page duplex press.

Ia., Audubon—The Advocate—7 column quarto press.

Ky., Pikeville—Cumberland Publishing Co., (job printer and newspaper)—saw trimmer and other printing equipment with motor.

Ky., Whitesburg—W. J. Raybold—electrical coal mining machinery.

La., Monroe—Atlas Oil Co.—gasoline refining machinery and equipment for proposed plant.

La., New Orleans—Celetex Co., 636 Common St.—pumps, coolers, refiners, drying ovens, automatic saws and water purification plant for factory at Marrero.

La., New Orleans—New Orleans Cigar Box Co., 1636 St. Roch St., O. Moser, Vice Pres.—machinery, electrically driven, for the manufacture of wooden containers of every kind.

Md., Cambridge—W. N. Andrews—machinery and equipment for fertilizer plant.

Md., Jarrettsville—Bd. Educ.—vocational equipment for new school.

Mass., Boston—Albany Milling Co., 61 Bristol St., D. Finberg, Purch. Agt.—chain mortiser and other miscellaneous tools for woodworking mill (used).

Mass., Northampton—W. E. Quinn Co., Hebert Ave., (distributor and manufacturer of woodworking machinery)—$2,000 worth of heat treating equipment.

Minn., Minneapolis—Bd. Educ., 305 City Hall, G. F. Womrath, Business Supt.—vocation equipment for proposed Franklin High School.

Minn., Minneapolis—Buzza Co., 16 South 8th St., (publisher), G. Buzza, Pres.—die stamping, envelope making, engraving and printing machinery for proposed addition to factory.

Minn., Minneapolis — Minnesota Woodworking Co., 1019 N. E. Main St., (manufacturer of ice chests and interior woodwork), M. Allroggen, Pres.—general woodworking machinery, to replace that which was destroyed by fire.

Miss., Poplarville—Nortac Mfg. Co.—machinery and equipment for proposed lumber mill at Orvisburg.

Mo., Bernie—G. W. Ray—paper folder, newspaper press and job press equipment.

Mo., St. Louis—W. Mason, 4749 Westminster Pl. (machine shop)—electric traveling crane of low type for building with 16 ft. clearance overhead.

N. Y., Adams Center—W. Alexander, Main St., (woodworking)—single surface broad planer, electrically driven (new or used).

N. Y., Adams Center—F. Newton Co., Main St., Rodman Road (manufacturer of leather)—leather splitter, electrically driven, 220 v., a.c., also forming equipment.

N. Y., Binghamton—R. M. Hinsdale, 13 High St.—baking ovens and equipment.

N. Y., Brooklyn—L. Stockman & Son, 218 Wyckoff Ave., (textiles)—No. 50 Universal coning or tubing machines (used).

N. Y., Buffalo—Bemis Bros. Bag Co., Northland Ave.—complete machinery and equipment for 5 story factory, for the manufacture of bags.

N. Y., Buffalo—Fisher Knitting Co., 1043 Jefferson Ave.—ribbing machines or sleevers, N. Y. E.—Tredick make (used).

N. Y., Buffalo—Pratt & Letchworth, 189 Tonawanda St. — equipment for proposed foundry.

N. Y., Buffalo—J. E. Smith & Sons Co., 50 Bway—machinery and equipment for addition to plant for the manufacture of butchers' machinery.

N. Y., Buffalo—T. & C. Smith, West Main and Northrup Sts.—gasoline service station equipment.

N. Y., Buffalo—T. C. Smith, 55 Eureka Pl.—service station equipment, including two 500 gal. gas tanks and pumps.

N. Y., Buffalo—A. Teachout & Son, Leslie St.—woodworking equipment to replace that which was destroyed by fire.

N. Y., Canton—T. Crandall, R. F. D. 5—sawmill machinery and equipment.

N. Y., Chaumont—Adams, Duford Co. (quarries and agricultural lime), E. B. Johnson, Purch. Agt.—screening and bagging equipment, also two 2½ ton chain hoists.

N. Y., Chili (Lincoln Park P. O.)—Harris Seed Co. (seed distributors)—machinery and equipment for addition to seed plant.

N. Y., Gouverneur—Gouverneur Limestone Co., H. H. Hodgkin, Purch. Agt.—conveying, screening and bagging machinery and equipment.

N. Y., Gouverneur—W. H. Loomis Talc Co.—grinding and pulverizing machinery.

N. Y., Jamestown—Empire Case Goods Co., Foote Ave. (manufacturer of dining room furniture), F. O. Anderson, pres.—woodworking machinery for 2 story addition to factory.

N. Y., Lockport—Simonds Mfg. Co., (steel mill and electric furnace plant)—hot saw for bar mill.

N. Y., New York—Arctic Hygeia Ice Mfg. Co., 300 East 133d St.—ice making machinery for proposed addition to plant.

N. Y., New York—A. Loewy, 200 5th Ave.—4 baling presses.

N. Y., Ogdensburg—Algonquin Paper Co., Inc., E. L. Strong, Purch. Agt.—cutting up rig with roll table.

N. Y., Oxford—Oxford Basket Co., E. S. Sharp, Purch. Agt.—machinery and equipment for the manufacture of wooden baskets.

N. Y., Penn Yan—F. Giziello—machinery and equipment for proposed factory for the manufacture of box crates and similar wooden products.

N. Y., Pine City—E. M. Sherman—blacksmithing machinery and equipment.

N. Y., Rochester—Buffalo, Rochester & Pittsburgh R.R., D. S. Jones, Asst. to Pres.—welding equipment for proposed plant at Salamanca.

N. Y., Sacket Harbor—C. Gamble & Co.—double surface planer for woodworking.

N. Y., Syracuse—Onondaga County, F. X. Wood, Court House, Purch. Agt.—one caterpillar crane, revolving ¾ yd., clamshell bucket, to cost not more than $9,500.

N. Y., Syracuse—Onondaga Hide & Leather Co., East Water St.—machinery and equipment for factory, to replace that which was destroyed by fire.

N. Y., Tonawanda—Paper Board Corp., (manufacturer of paper board products)—machinery and equipment to enlarge plant.

N. Y., Watertown—Watertown Boiler Wks., 941 West Main St., D. Corbett, Purch. Agt.—motor driven metal saw (new or used).

N. C., Leaksville—Leaksville Granite Co.—Champion jaw crusher, capacity 20 to 25 ton per hour; quarry cars with dump body, 1½ ton capacity.

O., Cleveland—M. A. Hanna & Co., Leader-News Bldg.—one 18 in. belt driven hand planer and jointer, one piece cast frame, metal bed, complete with counter shaft, for delivery at Buhl, Minn.

O., Cleveland—H. C. Wolf, 626 Sweetland Bldg.—complete refrigerating plant for market house.

O., Clyde—Clyde Cutlery Co.—forge shop equipment.

O., Martins Ferry—J. H. Beans Fdry. Co., T. Z. Burris, Genl. Mgr.—complete foundry equipment.

O., Middletown—Midwest Casting Co., H. S. Wise, Pres.—additional foundry equipment.

O., Warren—Trumbull Steel Co.—ingot pulling machine.

O., West Lancaster (Jeffersonville P. O.)—H. Herman, c/o Claffin Eng. Co.—machinery and equipment for the manufacture of tire building machinery.

Pa., Allentown—Allentown Spinning Co., Jordan and Gordan Sts.—twisting and spinning machines to replace those which were destroyed by fire.

Pa., Carlisle—Bellaire Rug Co.—4 x 4 ft. Knowles box loom.

Pa., Edge Hill—F. Comly—sawmill machinery.

Pa., Ellwood City—Ellwood Steel Co.—machinery and equipment for proposed addition to steel works.

Pa., Erie—Amer. Dry Cleaning Wks.—dry cleaning machinery and equipment for large plant, to replace that which was destroyed by fire and explosion (new).

Pa., Franklin—C. B. Collins, c/o Collins Safety Razor Co.—special machinery and equipment for the manufacture of patented no battery flashlights.

Pa., Lititz—The Trade, Box 339—linotype, linograph, 19 in. power paper cutter, newspaper press and multiple punch.

Pa., Nanticoke—Review—flat bed press.

Pa., North Warren—R. T. Jones—complete gasoline distributing station equipment, including several 12,000 gal. storage tanks.

Pa., Phila.—Equipment Exchange, Bullitt Bldg., (gas equipment)—4 ft. and 5 ft. turbo blowers, steel purifiers and condensers (used).

Pa., Phila.—General Paper Products Co., 3430 Lancaster Ave.—5 or 6 stamping presses (used preferred).

Pa., Phila.—Penn Throw Silk Co., Lena and Collom Sts., H. H. Phillips, Purch. Agt.—thousands of spindles for proposed mill at Allentown.

Pa., Phila.—United Mfg. Co., 1645 North 10th St., (glassware)—10 polishing and buffing machines, 1¼ in. spindles for heavy work.

Pa., Pittsburgh—Amer. Sheet & Tin Plate Co., Frick Bldg., M. S. Dennis, Purch. Agt.—two crane trolleys.

Pa., Pittsburgh—Universal Brick & Tile Co., Empire Bldg.—3 ton hoist.

Pa., Pittsburgh—Westinghouse Electric & Mfg. Co., G. G. Taylor, Purch. Agt., East Pittsburgh—machinery and equipment for plant for the manufacture of electrical products at Sharon.

Pa., Pottstown—Model Tire Co., G. Starkweather, Pres.—machinery and equipment for proposed addition to tire factory.

Pa., Wattsburg—W. Gilmore—machinery and equipment for the manufacture of baseball bats, to replace that which was destroyed by fire.

Pa., Wilkes-Barre—Sheldon Axle & Spring Co., 221 Conyngham Ave.—equipment for spring mill to replace that which was destroyed by fire.

R. I., Pawtucket—Bd. Educ.—equipment for manual training department of proposed addition to high school.

R. I., Tarkiln—Bragg Woolen Mills, Inc., J. F. Carpenter, Purch. Agt.—machinery for addition to plant.

S. D., Sioux Falls—A. Fanebust, 709 East 20th St. (building contractor)—grinder, electric preferred, for surfacing concrete walls.

Tenn., Knoxville—Cherokee Brick Co.—machinery and equipment for proposed plant.

Tex., Dallas—Oak Cliff Paper Mills, E. T. Fleming, Pres.—$75,000 worth of machinery for proposed box factory.

Tex., Greenville—Greenville Mill & Elevator Co.—mill and elevator equipment.

Utah, Midvale—Utah Steel Corp.—straightening machine for straightening 20 and 30 lb. rails.

Va., Ashland—Davis & Haley, (saw and planing mill)—fast feed molder, band rip saw and two excelsior mills.

Va., Ashland—Hanover Printing & Publishing Co.—large drum cylinder printing press for newspaper work.

Va., Ashland—L. G. Morris, R. F. D., Route 2, (wheelwright)—combination band saw, rip saw and mortising machine; drill; bench tools.

Va., Ashland—H. B. Wingfield, R. F. D. 4—sawing outfit.

Va., Bowling Green—R. C. Travers, (excelsior factory)—steam mill pump.

Va., Doswell—J. C. Haley, (excelsior mills)—excelsior machinery, belting and small tools.

Va., Doswell—G. Lyon, (excelsior mill)—excelsior machinery, belting and small tools.

Va., Doswell—Old Dominion Excelsior Mills, T. F. Flippo, Purch. Agt.—excelsior machinery, belting and small tools.

Va., Graham—Sutphin & Snell—machinery and equipment for shale brick plant, capacity 50,000 brick per day.

Va., Woodford—G. B. Buchanan—sawmill and logging outfit, also excelsior machinery.

Wash., Aberdeen—Port of Grays Harbor, F. H. Lamb, Pres.—receiving bids until Jan. 23 for a 5 ton, 95 ft. radius, Hammerhead type, lumber handling crane.

Wash., Spokane—Clearwater Timber Co., Old Natl. Bank Bldg.—machinery, equipment, dry kilns, etc. for proposed sawmill at Lewiston, Idaho.

Wis., Cedarburg—Everstyle Hosiery Co., (textile mill), J. Armbruster, Purch. Agt.—special knitting machinery, looms, loopers, spinners, etc., all power operated.

Wis., Hewitt—A. A. Ohm—special machinery for the manufacture of American cheese, also belting and shafting.

Wis., La Crosse—Perfect Oil & Gas Co.—oil storage tanks and pumps for proposed oil warehouse, etc.

Wis., La Crosse—Wisconsin Pearl Button Co., 726 North 3rd St.—punches, etc., for making buttons from clamshells.

Wis., Merrill—Lincoln Canning Co.—can sealing machines, conveyors, viners and 2 mechanical cookers.

Wis., Milwaukee—Atlas-Grennan Co., 927 Central Ave., (wholesale bakery), P. J. Stern, Purch. Agt.—power driven mixing and other machinery for the manufacture of cakes, etc.

Wis., Milwaukee—N. J. Kojmeier, 531 M. & M. Bank Bldg.—ice making machinery.

Wis., Milwaukee—Master Press, 635 12th St., (publishers), E. Hartman, Purch. Agt.—printing presses and paper cutting machine.

Wis., Milwaukee—Protection Equipment Co., c/o T. H. Gill, 1212 1st Wisconsin Natl. Bank Bldg.—machinery and tools for the manufacture of fire extinguishers.

Wis., Milwaukee—W. A. Weinreis, 246 Oregon St.—two 8 x 8 x 8 and two 10 x 10 x 110 steam driven air compressors.

Wis., Milwaukee—Western Brass Mfg. Co., c/o E. C. Rosenberg, 114 Grand Ave.—machinery, tools and equipment for the manufacture of brass valves, casting, etc.

Wis., Milwaukee—A. R. Wiens Son, 3220 Vliet St., G. R. Wiens, Purch. Agt.—special brush making machinery (power).

Wis., Milwaukee—J. Wilging & Co., 1612 Teutonia Ave., (building contractors)—dust collecting machinery for proposed shop.

Wis., Milwaukee—Wisconsin Ice & Coal Co., 216 West Water St.—refrigeration machinery for proposed addition to ice manufacturing plant.

Wis., Minocqua—H. Jung, (bakery)—power driven mixers, sifters, etc.

Wis., North Bend—North Bend Co-operative Creamery Co., J. Patterson, Pres.—creamery machinery and steam power equipment.

Wis., North Milwaukee—Winkelman & Co., Fond du Lac and Lake Rd., R. F. D., C. F. Winkelman, Purch. Agt.—sander, band saw and planer.

Wis., Oshkosh—Oshkosh Artcraft Rug Co., 116 Ohio St.—one 45 to 54 in. roll and one steam mangler (power driven).

Wis., Racine—Davies Shoe Mfg. Co., Northwestern and Carlisle Aves.—shoe making machinery for proposed addition to factory.

Wis., Racine—Horlick Malted Milk Co., Northwestern Ave.—gasoline storage tank and pump for proposed garage.

Wis., Sauk City—W. Holberleben—limestone crushing machinery (electric power).

Wis., Saxon—W. Weber—limestone pulverizing machinery.

Wis., Sheboygan—Bd. Educ., J. G. Walvoord, Secy.—mechanical drawing equipment, including about 100 drawing sets.

Wis., Sheboygan—F. Hensel Co., North 7th and Center Sts.—power, vulcanizing and automobile repair machinery for proposed garage.

Wis., Sheboygan—J. and W. Jung Co., 720 North 8th St.—refrigerating machinery for proposed plant.

Wis., Sheboygan Falls—Falls Motor Co.—special machinery for the manufacture of motors, to replace that which was destroyed by fire.

Wis., Sturgeon Bay—Fruit Growers Canning Co.—conveying equipment for proposed canning plant.

Wis., Sturgeon Bay—L. D. Smith Co.—steam shovel and stone crushing machinery.

Wyo., Torrington—Torrington Telegram—printing equipment for newspaper work.

Ont., Connaught—Night Hawk Peninsular Mines Ltd., A. R. Globe, Mgr.—ore conveyors, motors, shafting, rock crushers, stamps, tube and ball mills, probably cyanide apparatus, pumps, transformers and switches, for plant, capacity 400 ton of gold ore per day.

Ont., Glen Miller—Miller Bros. Co., G. H. Miller, Purch. Agt.—equipment for addition to pulp and paper mill.

Ont., Goudreau—Goudreau Gold Mines Co., Ltd., C. A. Foster, Gen. Mgr.—mill.

Ont., Kirkland Lake—Lebell Crystal Lake Gold Mine, H. S. Rose, Pres.—motors, transformers, switches, pumps, hoisting engine, compressors and possibly diamond drills.

Ont., Kirkland Lake—Lake Shore Mine, Ltd., H. Oakes, Pres.—rock crusher, and probably stamp mills, tube mills, cyanide tanks, etc., to enlarge capacity of mill from 70 to 300 ton per day.

Ont., Port Dover—Port Dover Planing Mills—additional woodworking machinery, to replace that which was destroyed by fire.

Ont., Stratford—Stratford Mfg. Co., Ltd., (woodenware, etc.), C. A. Moore, Mgr.—one chair seat mortiser with 10 in. sweep.

Ont., Thorold—Thorold Post Printing Co., D. Fendell, Mgr.—$10,000 worth of motor driven equipment for printing large show bills, etc.

Que., East Broughton—Asbestos Mines, Ltd.—machinery and equipment for plant, to replace that which was destroyed by fire.

Que., Montreal—Argonaut Gold Mine, Ltd., 601 Royal Trust Bldg., J. W. Morrison, Swastika, Ont., Mgr.—rock crusher, ball mill, tube mill, switches, transformers, pumps and cyanide tanks.

Que., Verdun — J. Harvey, 1290 Claude St.—printing press, cases and type.

Sask., Saskatoon—Saskatoon Hardware Co.—electric sanders for hardwood floors.

Metal Working Shops

Calif., Los Angeles—The Union Pacific R.R., 15th and Dodge Sts., Omaha, Neb., will soon receive bids for the construction of an engine house, locomotive shop, coach and car shop, new terminal yard, etc., here. Cost between $1,500,000 and $2,000,000. R. L. Huntley, 3344 Harney St., Omaha, Neb., Chief Engr. Noted Aug. 17, 1922.

Calif., San Francisco—The Auto Service Co. of Los Angeles, c/o O'Brien Bros., Inc., Archts., 240 Montgomery St., is having plans prepared for the construction of a 1 story garage and automobile service building in the Richmond District, here. Estimated cost $40,000.

Calif., San Jose—J. Whitney, c/o Wolfe & Higgins, Archts., Auzerais Bldg. is having plans prepared for the construction of an automobile trimming shop and rooming house, to contain 30 rooms on West Santa Clara St. Estimated cost $25,000.

Conn., Hartford — A. D. Brochu, 258 Windsor Ave., plans to build a 1 story, 60 x 100 ft. machine shop on Hillside Ave. Estimated cost $25,000. Architect not selected.

Conn., Stamford—The Stamford Gas & Electric Co., 11-17 Bank St., awarded the contract for the construction of a 3 story switch house. Estimated cost $50,000.

Ill., Chicago—D. S. Klafter, Archt., 64 West Randolph St., is receiving bids for the construction of a 125 x 150 ft. garage on Lawrence St. near Kentucky St. for B Schwartz, c/o Archt. Estimated cost, $50,000.

Ill., Chicago—D. Mahaffey, Archt., 118 North La Salle St., is receiving bids for the construction of a 2 story, 79 x 80 ft. factory on Argyle and Lincoln Sts. for N. A. Strand & Co., c/o Archt., manufacturer of surgical instruments. Estimated cost $50,000.

Ill., Chicago—The Tower Auto Corp., 20 East Jackson Blvd., awarded the contract for the construction of a 4 story, 130 x 175 ft. garage at 231 East Chicago Ave. Estimated cost $225,000.

Ind., Evansville—The Chicago & Eastern Illinois Ry. Co., McCormick Bldg., Chicago, is having plans prepared for 2 story railroad shop and roundhouse on Ross Ave. Rd., here. Estimated cost $3,000,000. Private plans.

Ind., Evansville—The Evansville Structural Supply Co., 215 1st Ave., is having plans prepared for the construction of a 1 story, 80 x 100 ft. fabricating plant. Estimated cost $27,000. Private plans.

Ind., Gary — The Bd. Educ. is having plans prepared for the construction of a 1 story, 70 x 115 ft. machine shop, foundry and laundry building on 6th St. Estimated cost $40,000. J. H. Wildermuth Co., 690 Bway, Archts.

Ind., Indianapolis—The Wangelin-Sharp Co., 443 Virginia Ave., is having plans prepared for the construction of a 2 story, 40 x 150 ft. addition to its automobile assembly plant. Estimated cost $45,000. R. F. Daggett, Consolidated Bldg., Archt.

Ky., Lexington—The Lexington Mine & Mill Supply Co., 544 West Main St., plans to build a 1 and 2 story, 50 x 210 ft. addition to its plant. Estimated cost $50,000. Architect not announced.

Md., Baltimore—Poe & Davies, Standard Oil Bldg., awarded the contract for the construction of a 2 story, 98 x 110 ft. garage and salesroom, at 414-24 North Calvert St. Estimated cost $54,000. Maryland Motors, Inc., 607 St. Paul St., lessee.

Mass., Springfield — The Standard Time Co., 81 Logan St., is having plans prepared for the construction of additions to its electric clock manufacturing plant, consisting of a 3 story, 50 x 90 ft. manufacturing building, a 1 story, 50 x 50 ft. shipping room and a 1 story, 30 x 50 ft. lumber storage building. Cost between $70,000 and $100,000. H. L. Sprague, 310 Main St., Archt.

Minn., St. Paul—The Amer. Radiator Co., 1807 Elmwood Ave., Buffalo, N. Y. awarded the contract for the construction of a 1 and 2 story, 65 x 200 x 1,000 ft. factory on Minnehaha and Fairview Aves., here. A. A. Landen, Vice-Pres. Noted Nov. 2.

N. J., Newark—The Kolba Constr. & Wrecking Co., 28 Peshine Ave., is having plans prepared for the construction of a 1 story, 45 x 101 and 100 x 100 ft. garage on Madison and Monroe Sts. Estimated cost $50,000. W. A. Tilton, 76 Montgomery Ave., Jersey City, Archt.

N. Y., Buffalo—The Automatic Tire Machine Corp., 19 Bush St., awarded the contract for the construction of a 1 story factory for the manufacture of tire machines, tools, etc. Estimated cost $12,800. Noted Dec. 14.

N. Y., Buffalo—Pratt & Letchworth, 189 Tonawanda St., plan to build a foundry. Estimated cost $9,000. Architect not announced.

N. Y., Buffalo—J. E. Smith & Sons Co., 50 Bway, plans to build a 1 story, 55 x 148 ft. addition to factory for the manufacture of butchers' machinery at 11-23 Blossom Alley. Estimated cost $15,000. Architect not announced.

N. Y., New York—D. Picin, c/o M. Del Gaudio, Archt., 160 West 45th St., will build a 1 story, 95 x 210 ft. garage on 170th St. and 3rd Ave. Estimated cost $50,000.

N. Y., Salamanca—The Buffalo, Rochester & Pittsburgh R.R., Rochester, plans to build a 1 story, 18 x 44 ft. acetylene welding plant on East End St., here. Estimated cost $68,000. Architect not announced.

O., Cleveland — The Fisher Bros. Co., 2323 Lakeside Ave. (grocery stores), is having plans prepared for the construction of a 1 and 2 story, 120 x 120 ft. garage and machine shop on Lakeside Ave. near East 23rd St. Estimated cost $75,000. M. F. Fisher, Pres. N. S. Longee, 500 Marshall Bldg., Archt.

O., Cleveland—The Peerless Motor Co., 2555 East 93rd St., awarded the contract for the construction of a 1 story, 60 x 156 ft. factory. Estimated cost $40,000.

Pa., Erie—The Watson Peck Co. awarded the contract for the construction of a 2 story, 50 x 110 ft. garage and service station on State St.

Pa., Galeton—The Galeton Garage Co. plans to rebuild its garage and service station, which was destroyed by fire. Cost between $35,000 and $40,000. Architect not announced.

Pa., Phila.—C. K. Johnson, c/o P. H. Tyre, Archt., 1509 Arch St., is receiving bids for the construction of a 2 story, 40 x 68 x 76 x 96 ft. garage on 15th St. and Passyunk Ave. Estimated cost $50,000.

Pa., Pittsburgh—The Robert P. McCurdy Co., Baum Blvd. and Craig St., is having plans prepared for the construction of a 3 story, 120 x 120 ft. garage and sales station on Millvale Ave. and Baum Blvd. Estimated cost $300,000. Hunting Davis Co., Century Bldg., Archts.

Pa., Pittsburgh—The Van Kleek Motor Co., 420 North Craig St., awarded the contract for the construction of a 3 story, 91 x 115 ft. automobile sales and service station on Baum Blvd. and Commerce Way. Estimated cost $150,000. Noted Dec. 21.

Pa., Wilkes-Barre—The Sheldon Axle & Spring Co., 221 Conyngham Ave., plans to rebuild portion of its No. 1 spring mill, which was destroyed by fire. Estimated cost $35,000.

Tex., Graham—The Le Sage Motor Co., c/o M. K. Graham, plans to build a 2 story, 75 x 100 ft. garage. Estimated cost $45,000. Architect not announced.

Wis., Chiltern—Hingess & Bessler, Kiel, are having plans prepared for the construction of a 1 story, 60 x 150 ft. garage, here. Estimated cost $40,000. W. F. Neumann, 114 Grand Ave., Milwaukee, Archt. Noted Nov. 2.

Wis., Racine—The Horlick Malted Milk Co., Northwestern Ave., is receiving bids for the construction of a 1 story, 70 x 120 ft. garage. Estimated cost $40,000. Private plans.

Wis., Sheboygan — The F. Hensel Co., North 7th and Center Sts., plans to build a 2 story, 60 x 100 ft. garage, repair and tire shop. Estimated cost $50,000. Architect not selected.

Wis., Sheboygan Falls—The Falls Motor Co. awarded the contract for the construction of a 1 story, 50 x 75 ft. factory for the manufacture of motors. Noted Dec. 21.

General Manufacturing

Calif., Fullerton—The Placienda Orange Growers Association plans to build a refrigerating and pre-cooling plant. Estimated cost $150,000.

Calif., Isleton—J. F. Butts, 2 Pine St., San Francisco, awarded the contract for the construction of a canning plant, here. Noted Dec. 7.

Calif., Oakland—The Garrett Lumber Co., 6801 East 14th St., will build a 2 story planing mill on 69th Ave. Estimated cost $6,500.

Calif., San Rafael—The National Ice Co., Postal Telegraph Bldg., is having plans prepared for the construction of a 2 story addition to its ice plant on 4th St. Estimated cost $100,000. Private plans.

Idaho, Lewiston—The Clearwater Timber Co., Old Natl. Bank Bldg., Spokane, Wash., is having plans prepared for the construction of a sawmill, here. Estimated cost $2,000,000. Wilkinson Bros., Minneapolis, Minn., Engrs.

Ill., Chicago—Garibaldi & Cuneo, 1 West South Water St. (fruit), are having plans prepared for remodeling 4 story, 100 x 125 ft. factory at 212 West Illinois St. Estimated cost $50,000. R. G. Schmidt & Co., 154 West Randolph St., Archts.

Ind., Brazil — The Stout Furniture Co. plans to build a 3 story addition to its furniture factory. Estimated cost $50,000. Architect not selected.

Ind., Clinton—The Dering Coal Co., 332 South Michigan Ave., Chicago, is having plans prepared for the construction of a 1 story, 50 x 125 ft. coal washer, here. Estimated cost $50,000. Allen & Garcia Co., 21 East Van Buren St., Chicago, Archts.

Ind., Fort Wayne—The Fort Wayne Box Co., Superior St., is having plans prepared for the construction of a 4 story 50 x 120 ft. box factory. Estimated cost $100,000. C. R. Weatherhogg, Citizens Trust Bldg., Archt. Noted Dec. 28.

Ind., Lawrenceburg — The Johnson & Klare Furniture Co. awarded the contract for the construction of a 3 story, 80 x 200 ft. addition to its furniture factory. Estimated cost $58,000. Noted Jan. 4.

La., Monroe—The Atlas Oil Co. plans to build a gasoline manufacturing plant. Estimated cost $100,000. Architect not announced.

La., New Orleans — The New Orleans Cigar Box Co., 1636 St. Roch St., plans to build a 1 story, 40 x 60 x 90 x 180 ft. plant for the manufacture of wooden containers of every kind. O. Moser, Vice-Pres.

Mass., East Walpole—Bird & Son, manufacturers of paper, are having plans prepared for the construction of a large addition to their plant. Monks & Johnson, 99 Channing St., Boston, Archts.

Minn., Minneapolis—The Bd. Educ., 305 City Hall, is having plans prepared for the construction of a 3 story Junior High School in Franklin district, near 15th Ave. N. and 4th St., including vocational department. Estimated cost $475,000. G. F. Womrath, Business Supt. Private plans.

Minn., Minneapolis—The Buzza Co., 16 South 8th St., publishers, having plans prepared for the construction of a 3 story addition to its office and factory building on Lake St. and Colfax Ave. Estimated cost $150,000. G. Buzza, Pres. Magney & Tusler, 126 South 9th St., Archts.

Minn., St. Paul—The St. Paul Gas Light Co., 6th and Cedar Sts., is having plans prepared for the construction of a 100 x 225 ft. generating plant and a 60 x 150 ft. coal pulverizing shed on an island in Mississippi River near Omaha Rd. Bridge. Toltz, King & Day, 1410 Pioneer Bldg., Engrs.

N. Y., Syracuse—The Onondaga Hide & Leather Co., East Water St., plans to rebuild the portion of its factory, which was destroyed by fire. Estimated cost $45,000. Architect not announced.

Wis., Milwaukee—J. Wilging & Co., 1612 Teutonia Ave., building contractors, are receiving bids and will open same about Jan. 15 for the construction of a 3 story, 60 x 120 ft. shop on 30th St. Estimated cost $30,000. Private plans. Noted Nov. 16.